

U.S. SYSTEMS INTEGRATION MARKETS

1989 - 1994

INPUT

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1989-1994

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Systems Integration Program (SIP)

U.S. Systems Integration Markets, 1989-1994

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Abstract

Systems integration continues to grow and has become a significant delivery channel for information services and products. Although systems integration originated in the federal government market over thirty years ago, it was not broadly recognized or accepted in the commercial market until the mid-1980s. Since then, however, the commercial market has received broad user acceptance, and in 1989, for the first time, commercial user expenditures exceeded federal expenditures.

This report analyzes the U.S. systems integration market as it existed in 1989, examines issues and trends that appear to affect the market, and forecasts market growth through 1994. The report identifies and analyzes SI market activities and forces, types of opportunities and leading vendors by vertical market segment, by market share of leading vendors and by SI components. The components include equipment, professional services, packaged software, and other services. Fifteen vertical markets are examined and important comparisons are made between the commercial and federal markets.

The report also presents and analyzes user/buyer issues, secondary market participants, and presents vendor market strategies and recommendations. Comparisons with the *Commercial Systems Integration Forecasts and Trends, 1988-1993* report are also included.

The report contains 180 pages and 99 exhibits and was prepared as part of INPUT's Systems Integration Program.

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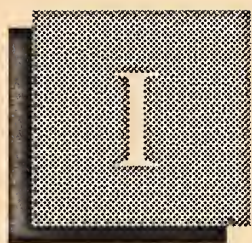
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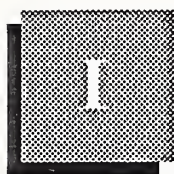
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Introduction





Introduction

This report on *U.S. Systems Integration Markets, 1989-1994*, is part of INPUT's Systems Integration Program. It updates the 1988-1993 report, *Systems Integration Forecast and Trends, 1988-1993*. It also identifies market, vendor, and buyer issues, and discusses trends that affect vendors in or about to enter this market. Analysis of both the commercial (CSI) and federal government (FSI) markets results in growth forecasts through 1994. The analysis also considers the prospects of vertical industry and cross-industry markets, vendors active in those markets, and factors likely to affect market potential.

The objective of the Systems Integration Program is to aid INPUT's clients in planning how to: select and penetrate the SI market, satisfy commercial and federal clients, and identify which vendors occupy significant positions in the industry at present. A separate report, *Systems Integration—Competitive Analysis*, examines the characteristics and strategies of the competitors, including profiles of leading SI vendors.

This report uses interviews of SI clients and vendors, and data from and discussion with forecasters at the Department of Commerce. It draws upon data bases assembled by INPUT for the annual *Information Services Industry* report, the INPUT *Federal Systems Integration Market* report and additions to the systems integration project data base begun in 1988.

A

Scope

The period covered in this report, including the market analysis and forecast, is calendar years 1989 through 1994.

1. Geographic Coverage

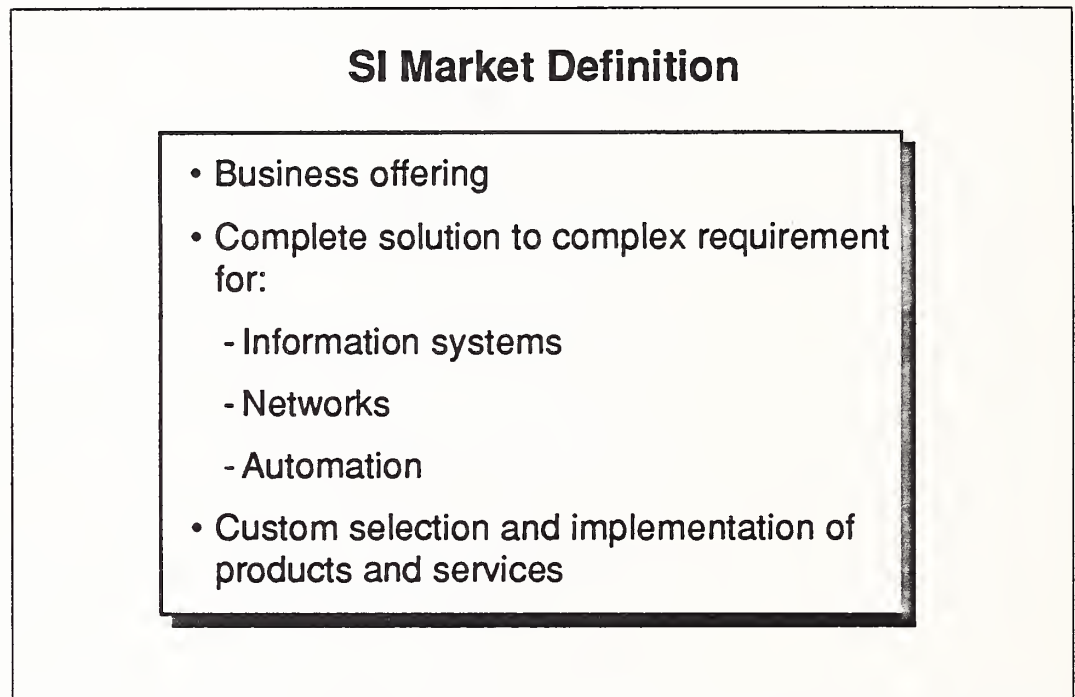
The report addresses contracted systems integration activities of U.S. vendors for U.S. businesses and governmental units. Estimates of current and future in-house integration project spending use Department of Commerce industrial capital equipment investment data. The principal growth

measures are increases in client SI contract spending. This avoids the potential for double counting that can occur when using reported vendor revenues.

2. Systems Integration Definition

INPUT is using the SI market definition in Exhibit I-1 for all aspects of the 1989 Systems Integration Program as well as this report. The emphasis is on provision of a complete solution to complex requirements and the custom selection and implementation of products and services.

EXHIBIT I-1



Typically, the integrator provides program management, which is overall management responsibility for the end product. It usually includes systems design, and development and provision of all equipment, software, and communications. The integrator also coordinates teaming arrangements with outside suppliers for engineering/data processing/personnel resources, and the documentation/training/post-implementation support required by the client, as seen in Exhibit I-2.

EXHIBIT I-2

Typical Tasks of SI Projects

- Total project management
- Process feasibility and tradeoff studies
- Systems design
- Selection/configuration of equipment and network
- Selection of systems software
- Selection/development of applications software
- Installation of equipment and software
- Systems integration (equipment and software)
- Testing and demonstration of system
- Documentation
- Client staff training
- Systems Operations
- Maintenance of equipment and software
- Financing

In assuming the responsibility and the risk, the SI vendor gives a warranty for the success of the system, essentially guaranteeing that it will operate as promised, will be delivered as stated, and will cost the agreed amount.

3. Market Parameters

The following characteristics are typical of complex, multidisciplinary information systems integration projects, and form the basis of the forecasts included in this report:

- Projects are usually multiyear efforts.
- Projects have significant project management demands.
- Target systems are usually strategically significant to the client's information environment.

- These systems require significant portions of the software to be custom developed and may include a large network requirement.

4. Industry Market Sectors

The systems integration market is separated by business and government activities into 15 vertical industry-specific sectors and 6 cross-industry sectors, as shown in Exhibit I-3. The industry sectors employ the U.S. Department of Commerce SIC (Standard Industrial Classification) codes. Appendix B lists the SIC codes at the two-digit level and shows how they map into INPUT's industry-specific sectors.

EXHIBIT I-3

Industry Market Sectors	
Industry-Specific Sectors	Cross-Industry Sectors
Discrete Manufacturing	Accounting
Process Manufacturing	Education and Training
Transportation	Engineering and Scientific
Utilities	Human Resources
Telecommunications	Office Systems
Wholesale Distribution	Planning and Analysis
Retail Distribution	
Banking and Finance	
Insurance	
Medical	
Services	
State and Local Government	
Education	
Other Industries	
Federal Government	

B**Report Organization**

The organization of the remainder of the report follows:

- Section II, Executive Summary, provides an overview of the report, highlighting the most significant information.
- Section III, Market Analysis and Forecast, defines the structure of the market, analyzes the marketplace and competitive factors, and forecasts five-year growth by component and industry, and includes 1989 market share information.
- Section IV, Vertical Industry Markets, analyzes the forces on, and potential of the 15 industry-specific markets, and provides forecasts for each.
- Section V, Market Strategies and Recommendations, focuses on the key items vendors should consider to win SI projects.
- Appendix A explains INPUT definitions.
- Appendix B lists the SI codes by industry sector.

Appendix C provides detailed component expenditure forecasts for 1989 and 1994, and the compound annual growth rate (CAGR) for the period, by vertical industry markets.

Appendix D provides a forecast data base reconciliation by industry sector between the 1988 forecast and this report, for the years 1989 and 1993.

C**Methodology**

The data for this report came from several sources. INPUT assembled the data into matrices of industries, project types, vendors, etc. The sources and data are as follows:

- Data came from interviews of companies that have recently completed or are now implementing complex systems. The baseline information appeared in the 1988 Systems Integration Project Report (SIPR). The format of this report was employed for additional interviewing conducted during 1989.
- Information from the U.S. Department of Commerce and comparisons with the SI project data base formed the basis of the update of the 1988 CSI market forecast.
- Derivation of the 1986 and 1988 forecasts came through the following steps:

- The estimate of the number of establishments (by industry) capable of supporting a major project effort came from INPUT's knowledge of current activity in CSI and the Department of Commerce list of firms in each of the SIC codes.
- INPUT estimated the proportion of these companies that might actually have major projects in any year and tested the estimates by interviews. The sample was the basis of the number of possible projects.
- The basis of the estimate of the average dollar value of these major projects was current CSI contracts, and the average value grown at a nominal rate including INPUT's inflation factors.
- The estimate of the yearly proportion of the total dollar value to be contracted to vendors used the assumptions shown in Exhibit I-4. The sum of the contract expenditure in a given year provided amounts for CSI spending in that year.
 - To spread the contract over the life of the project, INPUT assumed an average project life of three years for development. For simplicity, the outyear spending for support, operation, and maintenance is accumulated in the fourth year.
 - By industry, INPUT estimated the proportion of the total project dollars spent on each component and calculated the percent of the total spent in each of the four years of the project.
 - Dollars spent in each year on each component came from multiplying the proportion of the total project allocated to each component by the total value of the contracts for the selected year.
- Estimation of the range of values and growth rates of the industry-specific and cross-industry sectors and project components used the following steps:
 - New estimates of sector growth rates came from comparison of the range of contract values in the SI project data base for each vertical industry with the updated 1988 model and the forecasts of the 1989 INPUT Information Industry Survey.
 - Component (hardware, professional services, software and other) estimates were compared to summaries of projects in the SI data base, and the model used for forecasting in 1988 was adjusted accordingly. These adjustments were related to vendor-supplied revenue estimates and to vertical industry market data.

EXHIBIT I-4

Typical SI Contract Yearly Expenditures

	Percent			
	Year 1	Year 2	Year 3	Year 4
Computer equipment	-	100	-	-
Communications equipment	-	-	100	-
Systems software packages	-	100	-	-
Applications software packages	-	-	100	-
Consulting	60	20	20	-
Project management fees	40	20	20	20
Design/integration	45	35	20	-
Software development	-	50	50	-
Education/training and documentation	-	-	33	67
Maintenance and systems operation	-	-	33	67
Other	-	-	-	100

- Market shares came from interviews of vendors conducted by INPUT in 1989 for the Annual Information Industry Survey and the new SI Competitive Analysis profiles.
- Details of project composition also came from the SI project data base, along with estimates of technology utilization, infrastructure integration and application trends.

D

Economic
Assumptions

In developing the five-year forecast, INPUT incorporated the following economic assumptions about the outlook for the total U.S. economy. These assumptions are the basis for the INPUT *1989-1994 Information Services Forecast Industry Report* and the forecast of the systems integration delivery mode.

INPUT's forecasts are all in current dollars, which means that inflationary effects appear in the future years' figures.

INPUT assumes a continued slowing in real GNP growth over the next five years, as is shown in Exhibit I-5. Real GNP growth will decrease from a 2.8% annual rate in 1989 to a low of 2.0% in the last three years of this forecast period. In addition, the inflation rate, as measured by the GNP deflator, will increase between 1989 and 1991, and then stabilize at a level of 4.5% by 1994.

EXHIBIT I-5

Inflation/GNP Economic Assumptions (Percent)

	1988A	1989A	1990E	1991E	1992E	1993E	1994E
Real GNP	4.4	2.8	2.5	2.3	2.0	2.0	2.0
*GNP deflator	3.0	4.8	5.2	5.5	5.0	4.5	4.5
Nominal GNP	7.4	7.6	7.7	7.8	7.0	6.5	6.5

*Year-to-year comparisons

Source: U.S. Department of Commerce

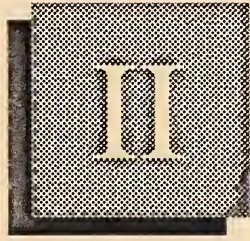
Primary expectations affecting INPUT's outlook for nominal GNP growth rates over the next five years include a slowdown in consumer spending (related to modest increases in real consumer income), and further decreases in federal defense spending (related to the need to reduce the federal budget deficit). Other factors are product-cycle maturation in certain key technology sectors, such as the low end of the personal computer market and minicomputers, and slight moderation of interest rates, particularly in the near term, reflecting Federal Reserve inflation control measures.

Historically, the information services industry has been more resilient during slowdowns in real GNP growth (reflecting unit shipments) than companies in the electronic components and equipment sectors. However, the ability to pass on inflationary pricing pressures is more varied in the information services industry. Several factors influence the ability of IS vendors to pass along inflation. These include: (1) the competitive structure of the industry, (2) the nature of the client-vendor relationship, (3) the labor-equipment mix, and (4) the maturity of the specific industry subset.

E

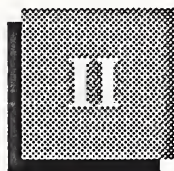
Related INPUT Reports

- Annual Market Analysis
 - Information Services Industry Report* 1989
 - Information Services—Industry-Specific and Cross-Industry Markets* 1988-1989
- Industry Surveys
 - Directory of Leading U.S. Information Services Vendors—1989*
- Market Reports
 - (SI) Buyer Issues Report* 1988
 - U.S. Professional Services Market, 1989-1994* 1989
 - Federal Systems Integration Market* 1989
 - Federal Professional Services Market* 1989
 - Systems Operations: Growth for the 1990s* 1989
 - Program Management in Systems Integration* 1989
 - Systems Integration Competitive Analysis* 1988-1989
 - Systems Integration Forecast and Trends* 1988



Executive Overview





Executive Overview

A

Major Buyer Issues

U.S. business, more than ever, is feeling the pressure of competition from both domestic and foreign companies. This pressure is forcing organizations to look closely at their core business to identify solutions that differentiate their products and services from the competition. In many cases, the application of technology can make the difference in offering a superior service faster, or reducing the length of product development cycles. These new solutions are becoming increasingly complex as they change traditional business processes and serve new organizational structures that often are required to operate around the clock and throughout the world. Exhibit II-1 identifies the major buyer issues in 1989.

EXHIBIT II-1

Major Buyer Issues—1989

- Competitive demands
- Core business focus
- Users becoming buyers
- Increasingly complex solutions
- New technology application
- Unavailable skills

As INPUT studies information systems budgets, it has become apparent that an increasing amount of information systems expenditures are no longer controlled by internal information systems organizations. This is because user organizations are in many cases becoming the buyers of solutions and control the budgets for them. Many of the solutions that users seek include new technologies such as artificial intelligence, image processing, and a variety of advanced telecommunications alternatives such as LANs, WANs, and MANs. Systems integrators with good track records provide an attractive alternative to internal information systems organizations that often lack adequate resources and skills to meet new user requirements. Some internal organizations also lack the application knowledge and experience in new technologies that is required in the solutions being sought.

B

Market Forecast, 1989-1994

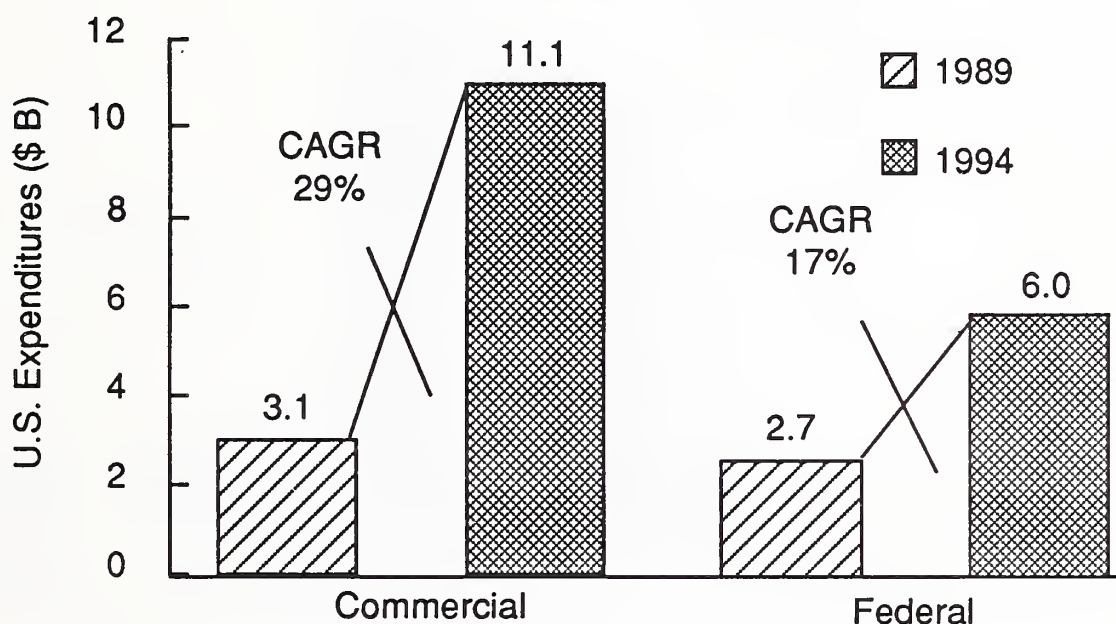
Despite a softening economic environment, domestic industry spent \$468 million for capital equipment in 1989. This was an increase of 9.6% over 1988 spending. A projected increase of 7.2% in 1990 over 1989 outlays—to \$502 billion—is anticipated, despite the accumulated debts of mergers, acquisitions and leveraged buyouts. Businesses continue to invest a share of this capital on information systems solutions to make themselves more productive and efficient in overcoming debts, competition, and/or softer markets.

Action by industry to solve the problems it faces has increased expenditures for commercial systems integration to \$3.1 billion in 1989, despite predictions of a lower GNP. INPUT forecasts that the still-cautious industry will continue to invest in new and expanded information systems, and that expenditures for vendor-provided SI solutions will reach \$11.1 billion in 1994. This represents a CAGR of 29%, down slightly from the 30% predicted last year. Narrowing margins and reluctance to invest in new information systems solutions, and much less use of outside vendors to implement them, are expected to hinder demand for systems integration. Exhibit II-2 provides the the forecast for both the commercial and federal markets.

The growth in demand is focused in three vertical industries, and is not uniformly spread across those facing increasing competition.

EXHIBIT II-2

Systems Integration Market Forecast Commercial versus Federal



The federal market has not grown as much as predicted earlier. The expected increase in large system authorizations has been delayed by the Gramm-Rudman-Hollings Act and defense cuts to reduce the national budget deficit. Expenditures for 1989 are expected to reach \$2.7 billion, and are expected to increase to \$6.0 billion in 1994. This represents a CAGR of almost 18%, the same level forecasted just a year ago.

C

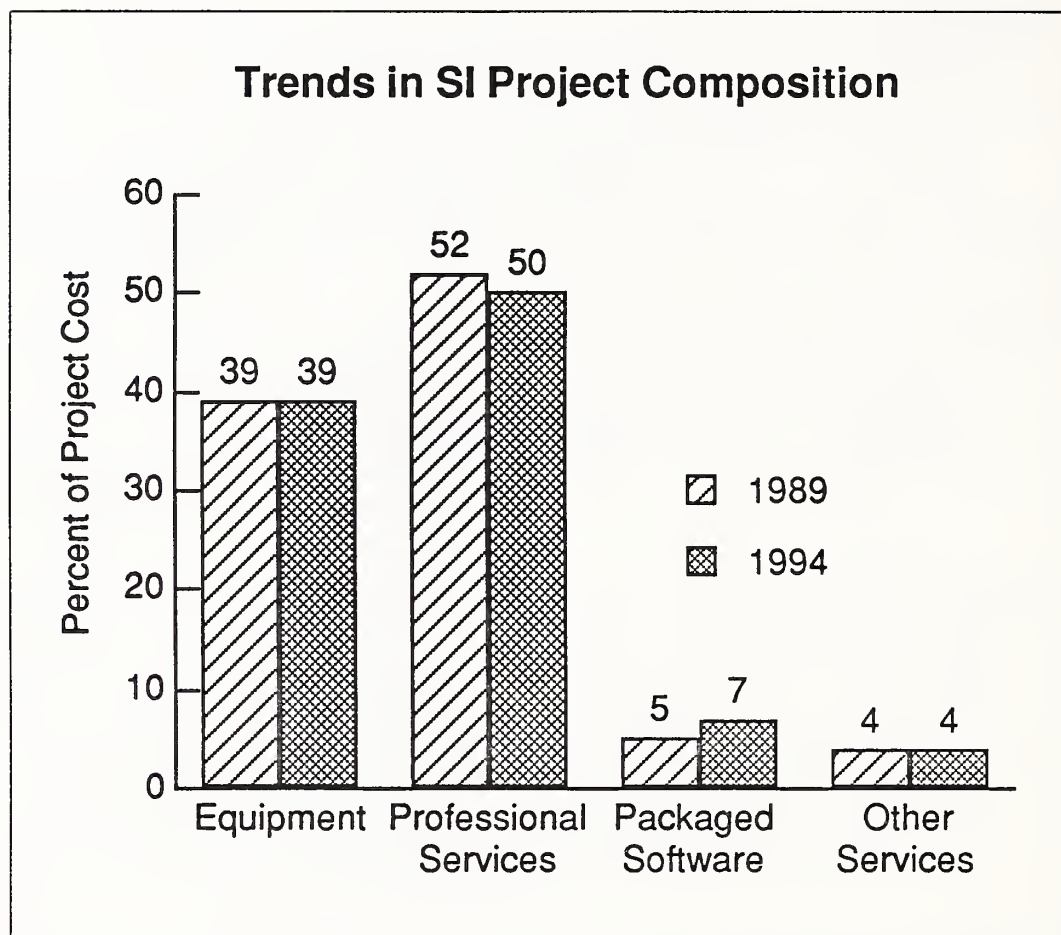
SI Project Composition Trends

SI expenditures can be broken into four basic components: computing and telecommunications equipment, professional services, systems and applications software, and other ancillary expenditures. The distribution of these expenditures in 1989 and 1994 are shown in Exhibit II-3.

Earlier forecasts anticipated that expenditures for equipment would drop—and they have, but at a faster rate than anticipated. The largest component of expenditure is professional services, which will drop 2% by 1994.

The drop in professional services, though still representing a CAGR of 23%, will be offset by rapid growth in packaged software (31% CAGR) as vendors continue to build base software products that can be tailored to

EXHIBIT II-3



an individual user's solution requirement. These software products will become increasingly important as they ease the pressure to acquire additional professional services skills, while improving the productivity of those already on hand. A further benefit of software products is that they reduce the risk inherent in an approach that requires that every new solution be designed "from the ground up."

The continuing shortage of qualified personnel, particularly program managers, and the increased workloads of current staffs have caused federal agencies to have greater dependence on SI utilization than the commercial sector. This market does not offer the same degree of opportunity for software products, however, as federal applications often require solutions that are different than those required in the commercial sector.

D**Forecast by Industry Sector**

Discrete manufacturing was the largest market for systems integration in 1989, and will continue to be throughout the forecast period. The key business functions continue to be streamlining and integrating the entire product development, manufacturing and distribution processes. This is a massive undertaking for most companies, but is essential to retain competitiveness and market share.

EXHIBIT II-4

Forecast by Industry Sector

Sector	\$ Billions		CAGR (Percent)
	1989	1994	
Discrete Manufacturing	.78	3.5	35
State and Local Government	.47	1.4	24
Banking and Finance	.32	1.3	33
Retail Distribution	.19	.94	38

State and local governments will be the second largest SI market over the forecast period. These organizations have many of the same problems of the federal government, and provide integrators with an opportunity to replicate a solution over a sizeable number of governments.

The third largest CSI market is, and will continue to be, banking and finance. While this sector is still recovering from the over-ambitious attempts of software product vendors to integrate banking operations, deregulation ensures that companies in this sector cannot stand still. Integration of a number of individual services into systems that relate all of a customer's activities with the institution continues to be a major objective and opportunity for systems integrators.

Retail distribution is the fourth largest vertical industry, with opportunities focused on inventory management. Intense competition and low margins place immense pressure on both product availability and minimizing cost of inventory.

E**Vendors' Goals and Objectives**

Most of the vendor goals and objectives identified in Exhibit II-5 are market driven. Systems integration is a very high-level distribution channel for the complete range of information and telecommunications products and services. It provides or limits product access to the largest users in U.S. industry. Vendors who do not have access to this channel fear that they will lose market and control of their existing customers. They are most likely correct.

EXHIBIT II-5

Vendor Goals and Objectives

- Long-term account control
- Full service image and offerings
- Industry knowledge and skills
- Market coverage
- Proprietary products and methodologies
- Market participation

The information industry has evolved from a product to a services orientation and from an environment where the customer was totally responsible for implementation to one where vendors are assuming these responsibilities. Customers are seeking one-stop shopping and vendors are striving to add additional products and services so as to become "full service" providers. User organizations are clearly looking outside for a single point of responsibility. Product and service providers are adding front-end consulting and back-end operations. Some are seeking to achieve these goals by building from within or by making acquisitions, and others look to alliances to provide this image.

Vendors recognize the importance of understanding the client's business, particularly in an environment where long-term relationships are important. To achieve this goal, vendors are making significant investments in industry architectures and solutions, hiring industry experts and establishing alliances with consulting firms or professional services firms that already have industry expertise.

The larger vendors that already have product industry coverage have established goals to improve their SI vertical industry coverage to protect their existing customer relationships. Smaller vendors are honing niche skills and gaining market coverage through alliances with the larger vendors who seek vertical industry skills.

Vendors are building and marketing proprietary products and methodologies. Solid methodologies for requirements analysis, systems design, program management and integration and implementation improve the odds for program success and reduce the risk of catastrophic failure. They also build a record of success that can be used for reference selling.

Framework products are also being developed that can be tailored to a client's specific business needs.

Finally, a growing number of secondary vendors are seeking participation in the market. Many have products that were previously sold as standalone systems, but are now candidates for integration into larger solutions. These products include robots, warehouse storage and retrieval systems, on-board computers, and a variety of communications products. Other vendors seeking SI participation include companies that have developed solutions internally and want to market these skills to others in their industry.

F

Vendor Market Share, 1989

IBM has a significant lead in both the commercial and government industry sectors of systems integration. This hardware manufacturer's experience in systems extends back more than thirty years, long before the acronym SI appeared in print. IBM has increased its focus on this market with the formation of its Applications Systems line of business. This organization goes beyond systems integration and is focused at providing a full range of solutions, from packaged application software through large, tailored integrated solutions. As of late 1989, IBM was field-testing the move of its tactical commercial SI resources from its Systems Integration Division directly into the field marketing organization, closer to the customer. Vendor market shares of the top five vendors in 1989 are presented in Exhibit II-6.

EXHIBIT II-6

Vendor Market Share 1989

Vendor	Revenue (\$ Millions)	Percent
IBM	930	15
Andersen Consulting	560 ¹	10
EDS	545 ²	9
CSC	400	7
Unisys	400	7

1. Excludes equipment revenues

2. Non-GM business

Andersen Consulting, little known in the information services industry just a few years ago, continues to demonstrate dramatic growth in the SI market. Ranked third last year, Andersen moved to second this year, based almost entirely on commercial SI revenues. Andersen has followed a long-term strategy that focuses on "change management." It starts with business consulting to assist in client management of change in organization and business processes, flows into implementation, and in some cases continues with a long-term systems operations contract. Andersen is vertical industry-oriented, and has skills, technology and/or demonstration centers and software products to address most industries. Andersen is not at present a significant player in the federal market.

EDS, a subsidiary of General Motors, is the leading systems operations/SI vendor, second in SI revenues to IBM in the federal sector, and third overall. One of its strengths is its familiarity with vertical markets based on its experience in remote data processing and/or systems operations (facilities management) in most industry sectors. It also benefits from the manufacturing industry and telecommunications experience of its parent. Systems integration is an excellent vehicle for EDS to protect existing systems operations customers and develop new ones. Strong project management and risk management practices have made EDS an aggressive competitor.

CSC made its SI mark in the government sector (both state and federal), employing its extensive experience as a full service vendor to win contracts. This firm is third in the federal sector and a frequent competitor of EDS/GM. CSC also has broad commercial SI experience.

Unisys also has a prominent position in the SI market, based primarily on its success in the federal sector. Former Burroughs and Univac federal organizations provided an excellent base for Unisys' participation in the SI market. A recent reorganization brings these units together with their commercial SI resources and should continue their record of growth.

G

Recommendations

Systems integration is one of the services that clients seek as they continue to move toward a broad range of "outsourcing" alternatives. They seek services that range from front-end consulting, through SI, to systems operations. INPUT believes that client businesses and public sector organizations will seek vendors that can provide a full range of these products. Equally important is the notion that once a vendor is selected to do the front-end consulting, it is in a favored position to win the systems integration and even systems operations contracts. Vendors should strive to present this full service image, as indicated in Exhibit II-7.

EXHIBIT II-7

Recommendations

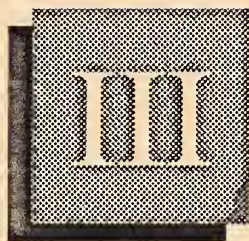
- Present full service image
- Leverage unique capabilities and products
- Establish strategic partnerships (alliances)
- Manage risk containment (program managers)
- Develop focused market strategies

Vendors should assess their current skills and capabilities and build strategies that use them effectively. SI includes too much risk to attempt to provide broad industry coverage if the vendor does not have the necessary skills or experience.

SI is a very complex business. Few vendors have all of the products, skills, and capabilities to satisfy the needs of systems integration programs. Teaming, program partners and alliances are common in meeting a client's integration requirements. Vendors must establish a set of relationships and alliances for long-term success in this market. Partners should be selected carefully and the resulting alliances managed thoughtfully.

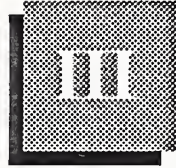
Systems integration is a big-stakes game, with great potential for failure. Some clients are aware of the gamble and will give higher rewards to the vendor that can demonstrate a good track record of risk management and containment.

Success and customer acceptance is based on confidence in the vendor's track record in providing solutions in the customer's industry. To be successful, vendors must develop focused strategies for each market to be addressed.



Market Analysis and Forecast





Market Analysis and Forecast

Systems integration provided by outside vendors in the commercial sector continues to mature. Economic conditions and a lack of skilled labor are pressuring businesses to use outside sources to develop and integrate their information support requirements.

The same conditions triggered the use of outside vendors for systems integration in the federal government market more than thirty years ago. Although there are differences between the two sectors, principally in how opportunities arise and are bid, the product and service components appear to be quite similar. Several vendors in the market now have contracts in both sectors.

In this section, the market is defined to set up the framework for analysis. The components are sized and forecasted. Key driving and hindering forces are identified, and the competitive environment is described. The first step is delineation of the market structure.

A

Market Structure

Understanding INPUT's definition of systems integration is important to understanding the contents of this report.

1. General Market Characteristics

a. Definition

Systems integration is a business offering. It provides a complete solution to a complex information system, networking, or automation requirement through the custom selection and implementation of a variety of information products and services.

A system integrator is responsible for overall management of a systems integration contract. The integrator is the single point of contact and is responsible to the buyer for system function, performance, schedule, cost, and final delivery.

Critical to the approach from both the client's and vendor's perspectives is the sharing or total transfer of responsibility (and risk) for the successful development of the system from the client organization to the vendor(s). In exchange for assuming the risks of failure to deliver the desired solution on time and within budget, the integrator receives project management fees from the client. The integrator also receives markups on the work of subcontractors and has the "inside track" in providing any of the products and services that make up the total solution.

b. Products and Services

INPUT divides systems integration into four components:

- Professional services
- Equipment
- Packaged software
- Other services

This approach allows a more comprehensive comparison of projects in and between different commercial sectors, as well as with the federal government sector. At times, the professional services component is subdivided into software development, program/project management, consulting, design/integration, education/training and documentation, and systems operations (facilities management).

Exhibit III-1 lists the products and services that may be a part of a systems integration project and from which the vendor can expect to receive revenue. Since each project has unique requirements, not all of these components apply. Further, the specific client requirements dictate the proportion of the total project expenditures for each component involved.

Using the current SI definition, INPUT includes within the project revenue all those post-implementation activities included in the original contract. These might include systems operations (SO) or equipment/network software maintenance when the client operates the system. SO can include: equipment/network maintenance, software maintenance, extended education and training of client employees, and network management. Systems operations, previously called facilities management, can also be provided by vendor-furnished information resources that are dedicated to the customer's business.

Several products and services are excluded from INPUT's definitions of SI and the list shown in Exhibit III-1. They are:

- "Embedded" systems that are end-connected to machinery or tools or industry-specific transportation facilities

EXHIBIT III-1

**Products/Services in Systems
Integration Projects**

- Equipment
 - Information systems
 - Communications
- Software products
 - Systems software
 - Applications software
- Professional services
 - Consulting
 - Feasibility and tradeoff studies
 - Selection of equipment, network, and software
 - Project management
 - Design/integration
 - Systems design
 - Installation of equipment, network, and software
 - Demonstration and testing
 - Software development
 - Modification of software packages
 - Modification of existing software
 - Custom development of software
 - Education/training and documentation
 - Systems operations/maintenance
- Other miscellaneous products/services
 - Site preparation
 - Data processing supplies
 - Processing/network services
 - Data/voice communication services

- Robots and dedicated automation equipment separately programmed and operated outside of the plant information system(s) data stream
- Turnkey systems prepackaged to satisfy a specific application or applications and designed to function in a standalone mode

2. Commercial versus Federal Systems Integration

The federal government has relied on systems integrators to develop, upgrade, or replace automatic data processing systems for over thirty years. Commercial systems integration, with some of its roots in federal SI, has both striking similarities and differences with government contracting (see Exhibit III-2).

The commercial sector customer is less likely to have the legal or technical background required for SI projects. When this knowledge is available, it may be fragmented among many people on the client staff. In the federal government, on the other hand, project offices are established that include both technical and legal representatives that speak for the sponsoring agency. Fewer interfaces are involved.

A key difference between the two markets is the formality of evaluating vendors in the bid selection procedure. In the federal marketplace, estimated versus actual vendor performance on cost and schedule is recorded (the Defense Contract Audit Agency does this for Defense, but makes the evaluations available to all agencies). Agencies use this historic information to weigh the vendor's past performance (called Weighted Guidelines).

In the commercial world, a federal track record of successful implementations may be desirable and leverageable. Conceptual strength is a key requirement, because the commercial customer relies on the vendor to offer a business solution. State and federal agencies are more specific about the desired solution, at least functionally.

The business conditions associated with the two markets are widely divergent, with some definite advantages to the government market. The federal agencies advertise in the *Commerce Business Daily* (a Department of Commerce publication) about impending solicitations, and describe key programs in publicly available documentation. Field sales can help to qualify the opportunity. Commercially, the vendor is heavily dependent on the sales force for leads.

The requirement for competitive bids for contracts over \$100,000 in the federal sector has no counterpart in the commercial world. While competition can be used by the client to achieve a desirable solution at the best price, other factors (vendor reputation, comfort level with the vendor, etc.) do come into play. Further, the requirements for competition

EXHIBIT III-2

Commercial versus Federal Systems Integration Characteristics

Characteristic	Federal	Commercial
Customers Requirements knowledge Technical knowledge Interface	Variable Variable Multiple	High High Single
Vendors Vertical expertise Customer base Business knowledge Reputation	Preferred Leverageable Required Media-based	Mandatory Reference Optional Historic
Business Conditions Lead generation Competitive bids Bid complexity Expenditure commitment Risk exposure Contract type Price restrictions Bonuses Penalties Profit potential	Field sales Optional Variable Deferrable High Fixed-price Competitive Unlikely Unlikely High	CBD/budgets Required High "Guaranteed" Contained Combination Ceilings Awd./incent. Exception Limited

prohibit agencies from specifying name brand products in the RFP. The federal process is more open and public, fostering a level of competition in which discounting in fixed-price bids is frequent.

Competitive bidding in the federal sector is a complex process that involves considerable expenditure of time, effort, and money on the part of the vendors, with no assurance of award. Vendors can recover part of their expenses, but the amount is stringently controlled. The trade-off is that once the process starts, the expenditures are virtually guaranteed or

termination costs are paid to close the project down. In the commercial sector, expenditure commitments may be deferred or withdrawn at the client's choosing, with no recourse for the bidding vendors.

The risks to the contractor appear to be much greater in the commercial marketplace. The contracting rules in the federal sector lead to compliance with the "letter" of the specifications and some measure of risk-sharing with the client agency. The absence of these rules in the commercial marketplace creates an environment where the specifications are more at issue and, consequently, more subject to interpretation (and misinterpretation), creating the prospect of contract performance suits.

Unless the contract is fixed-price, federal regulations may specify price ceilings. Fair pricing regulations specify that profit can be no more than 15%, and permit agencies to audit vendor records to verify these conditions. There are no such rules in the commercial sector, where competition and demand determine the acceptable price range.

Vendor capabilities in the commercial sector are usually based on written proof, previous success testimony, or live systems demonstrations emulating a critical function of the desired system. In the federal marketplace these capabilities must be proven. Satisfactory evidence may be scores under the "Weighted Guidelines," actual performance against project benchmarks, or "compute-outs" against competitor solutions.

Pricing strategies differ in that commercial jobs are frequently fixed-price without bonuses but with penalties. Government SI contracts may be fixed-price, cost-plus fixed-fee, or a combination of both types. Further, it is not unusual for the government to motivate a contractor to better system performance or shorten the delivery schedule, with incentive or award fees.

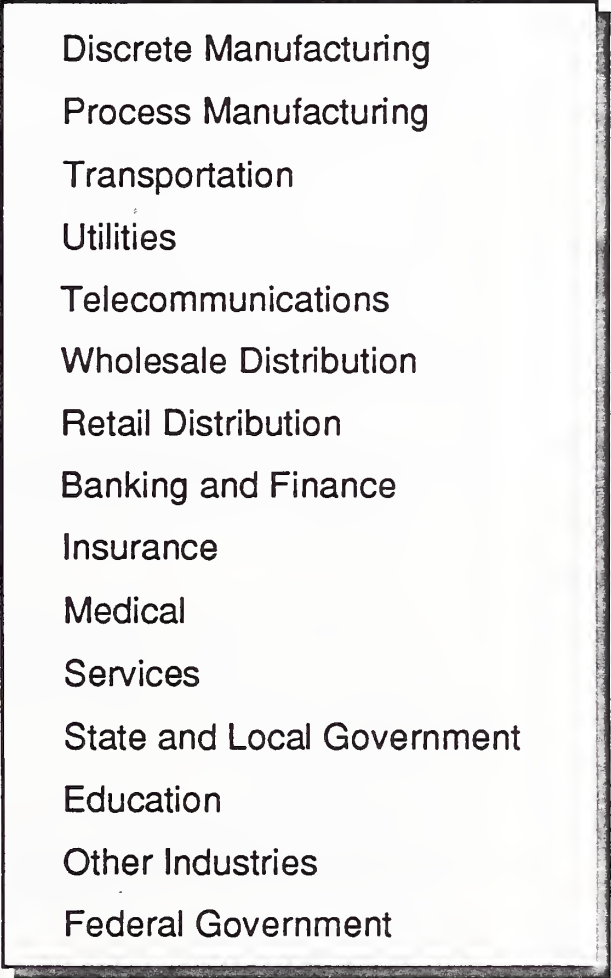
Federal agencies require in-depth reviews of component performance as a means of verifying/validating a contractor's work. This practice is seldom found in the commercial arena.

The commercial/federal SI market distinctions revolve around the procedural and regulatory (legal) backbone of the contracting process. Some of these more formal practices of the federal and state government market appear in the commercial market, when clients find them beneficial. Commercial clients will eventually adopt those practices that protect them.

3. Industry Market Sectors

The design and application of information resources are evolving along several avenues, each attracting vendors with particular skills, resources and experience.

Currently, most vendors have focused on one or two vertical industries, where a successful implementation is leveraged for contractual add-ons and other awards in the same industry. Other vendors are specialists in cross-industry (non-industry-specific) technologies, and focus not only on bidding these opportunities, but also teaming with industry-specific vendors to improve award prospects. INPUT's 1989 SI forecast includes fifteen vertical industry markets, but does not include the cross-industry markets.

EXHIBIT III-3**Industry Market Sectors**

- Discrete Manufacturing
- Process Manufacturing
- Transportation
- Utilities
- Telecommunications
- Wholesale Distribution
- Retail Distribution
- Banking and Finance
- Insurance
- Medical
- Services
- State and Local Government
- Education
- Other Industries
- Federal Government

The industry sectors in the SI forecast are the same as those employed by INPUT in its Market Analysis Program (MAP) and are identified in Exhibit III-3. The SI data correlates with the MAP forecasts. Appendix B of this report lists the SIC Codes associated with each sector.

The distribution sector is now divided into retail and wholesale, because they are growing at different rates. The education industry sector is separately listed in this report, and not under "Other Industries," as in the 1988 and earlier issues of SI forecasts. The "Other Industries Sector" combines those industries with smaller than nominal size or growth potential.

The services sector includes several independent professional and technical service components.

4. Vendor Classification

Vendors from a wide variety of core businesses have entered the systems integration business. SI has been recognized not only as a source of revenues and profits, but also as an important channel for the distribution of vendors' product or service offerings.

Computer and telecommunications equipment vendors, as well as professional services vendors, recognize that SI is a significant channel for their products. If they do not have access to this channel, they risk losing market share. INPUT has developed several approaches to assessing vendors and their capabilities in the course of SIP research. Several methods for examining and/or evaluating SI companies have emerged in the course of SIP research.

- Market share by annual revenues permits sizing of the leaders. The vendor analysis is divided into commercial and federal markets, because there are substantial differences among all but a few leaders.
- Vendors can also be characterized by their market focus. Some vendors have a narrow focus and specialize in one or two vertical industry markets, while others attempt to provide broad industry coverage of multiple markets.
- Market share by class of competition employs six distinct classes of SI vendors' primary lines of business, subdivided into commercial and federal markets. The classes used in this analysis are:
 - Hardware manufacturers
 - Communications vendors
 - Professional services firms
 - Big Six (and management consultants)
 - Aerospace firms
 - Other (engineering, construction, etc.) firms
- Preliminary analysis examined the delivery modes of key services and products, similar to the listing shown in Exhibit III-1.

- Another classification approach identifies significant secondary market vendors and their specialties. The initial examination used information acquired for INPUT's *Annual Information Industry Report*.

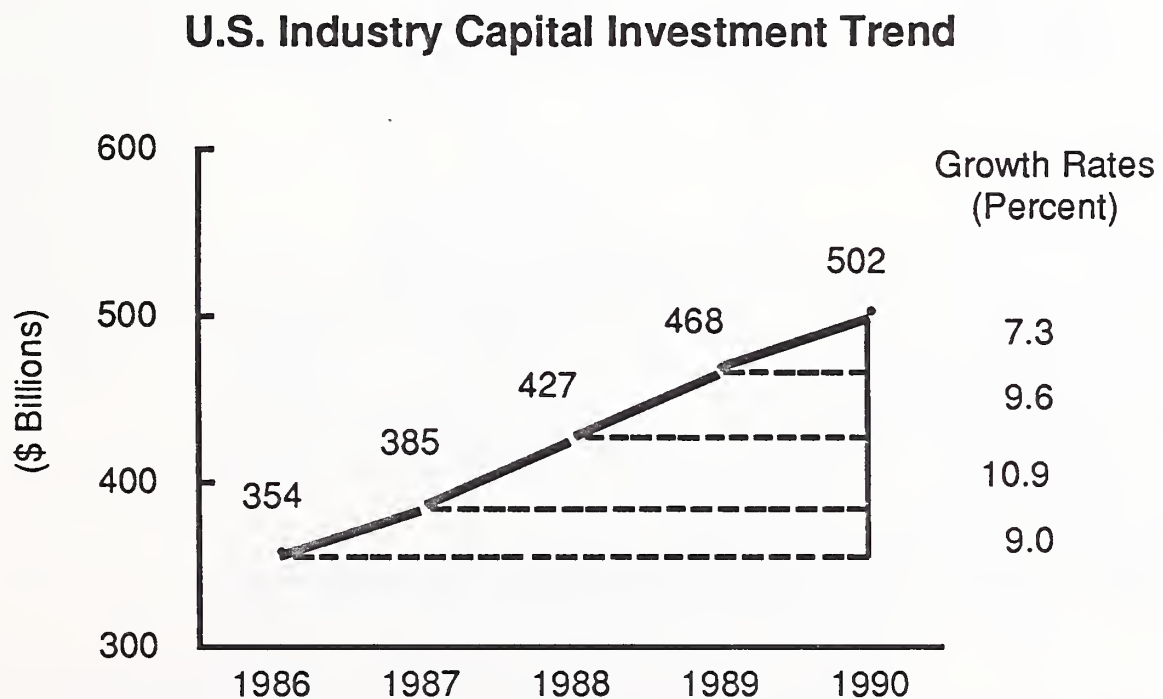
B

Market Forecast

Several factors, discussed in the next subsection (C), drive the systems integration market. The prime mover, however, is the availability and commitment of funding with which to implement information system solutions.

In 1989, U.S. industry invested \$468 billion in capital equipment, an unexpected increase of 9.6% over 1988. Despite the concerns about the recent slow growth of the GNP, industry told the U.S. Department of Commerce that it intends to spend \$502 billion in 1990, an increase of 7.3% over 1989, as shown in Exhibit III-4. These numbers are significant to the information industry, because about three percent of capital investment goes toward information systems additions and improvements.

EXHIBIT III-4

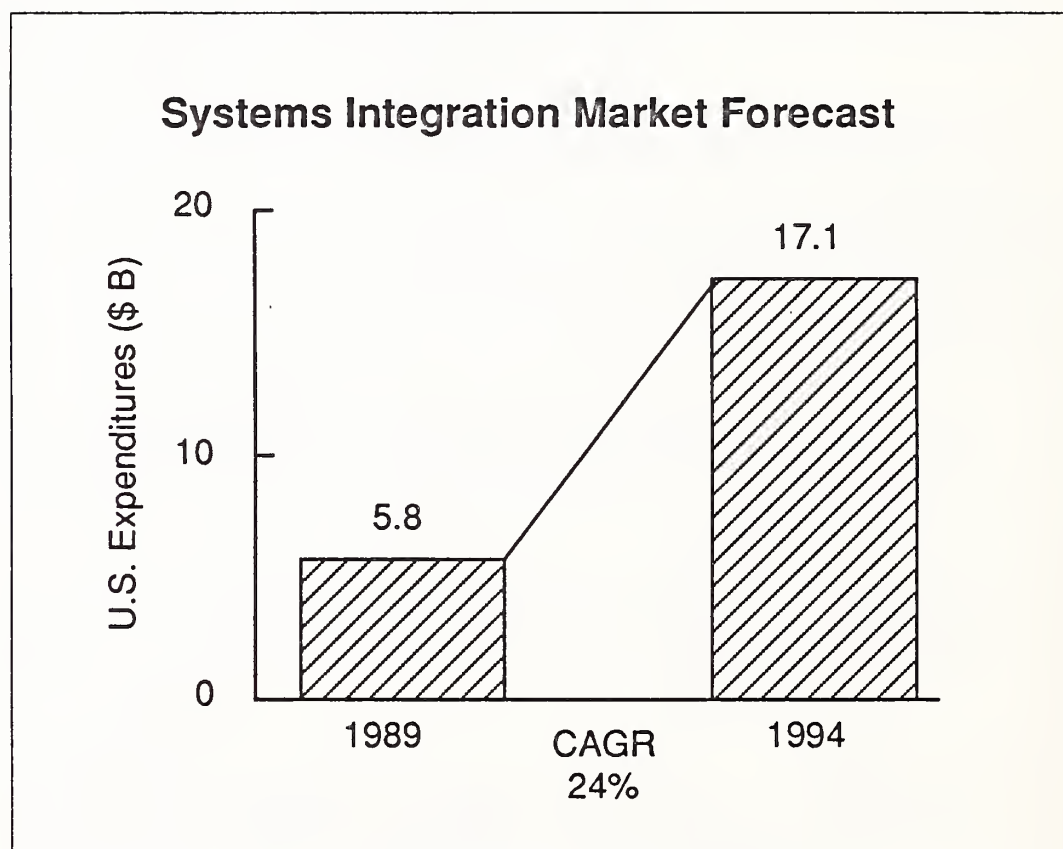


Source: Nov. 1989 Commerce Dept.

Similarly, the U.S. federal government continues to invest in data processing and communications products and services. The need for productivity continues despite concerns about budget deficits and rising costs. The federal information technology budget represents about 1.6% of the total national budget, and continues to grow at nearly twice the rate of the national budget.

Based on these changes, INPUT forecasts SI contract expenditures of \$5.8 billion in 1989 for the combined commercial and federal market. Growing at a compound annual rate of 24%, annual SI contract expenditures will reach \$17.1 billion in 1994, as illustrated in Exhibit III-5. The CAGR has declined by one percent since the early 1989 forecast, resulting from a downward shift in federal outlays.

EXHIBIT III-5



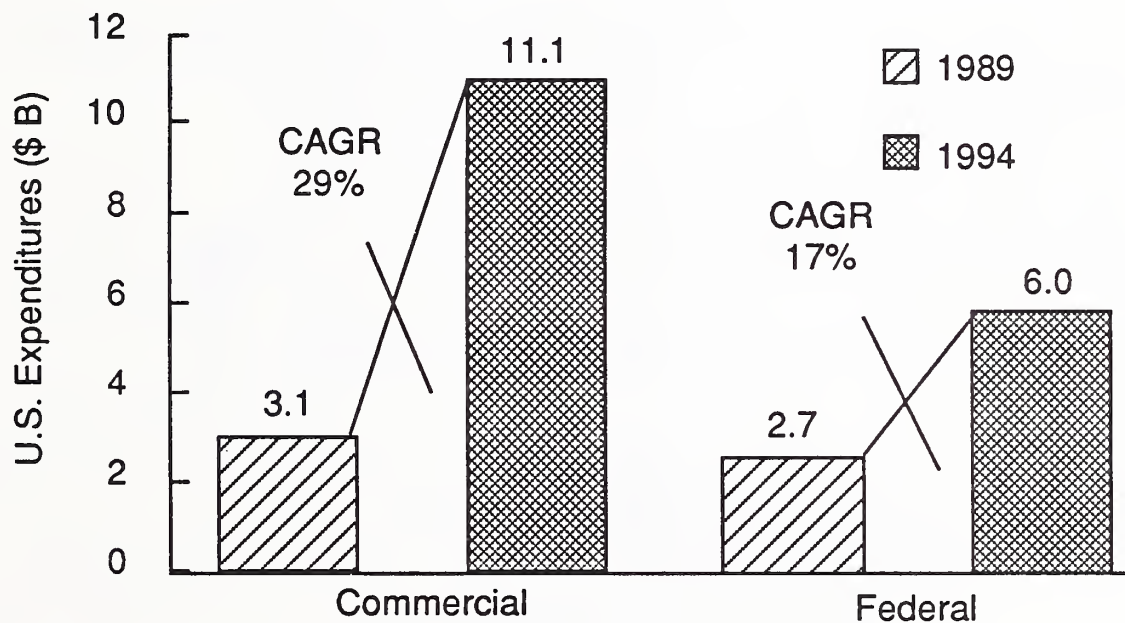
1. Commercial versus Federal SI Markets

Internal and external changes continue to influence the growth of both the commercial and federal markets. Although the expenditures in the commercial market in 1989 reached INPUT's forecast made in 1988, the out-year prospects suggest a slightly lower CAGR of 29%, not the earlier 30%. Annual commercial SI expenditures should reach \$11.1 billion in 1994, as indicated in Exhibit III-6—not the \$11.6 billion that would have resulted from 1988 growth projections. The reduction is primarily the

result of lower growth rates in the banking/finance, retail distribution, utilities and medical industries.

EXHIBIT III-6

Systems Integration Market Forecast Commercial versus Federal

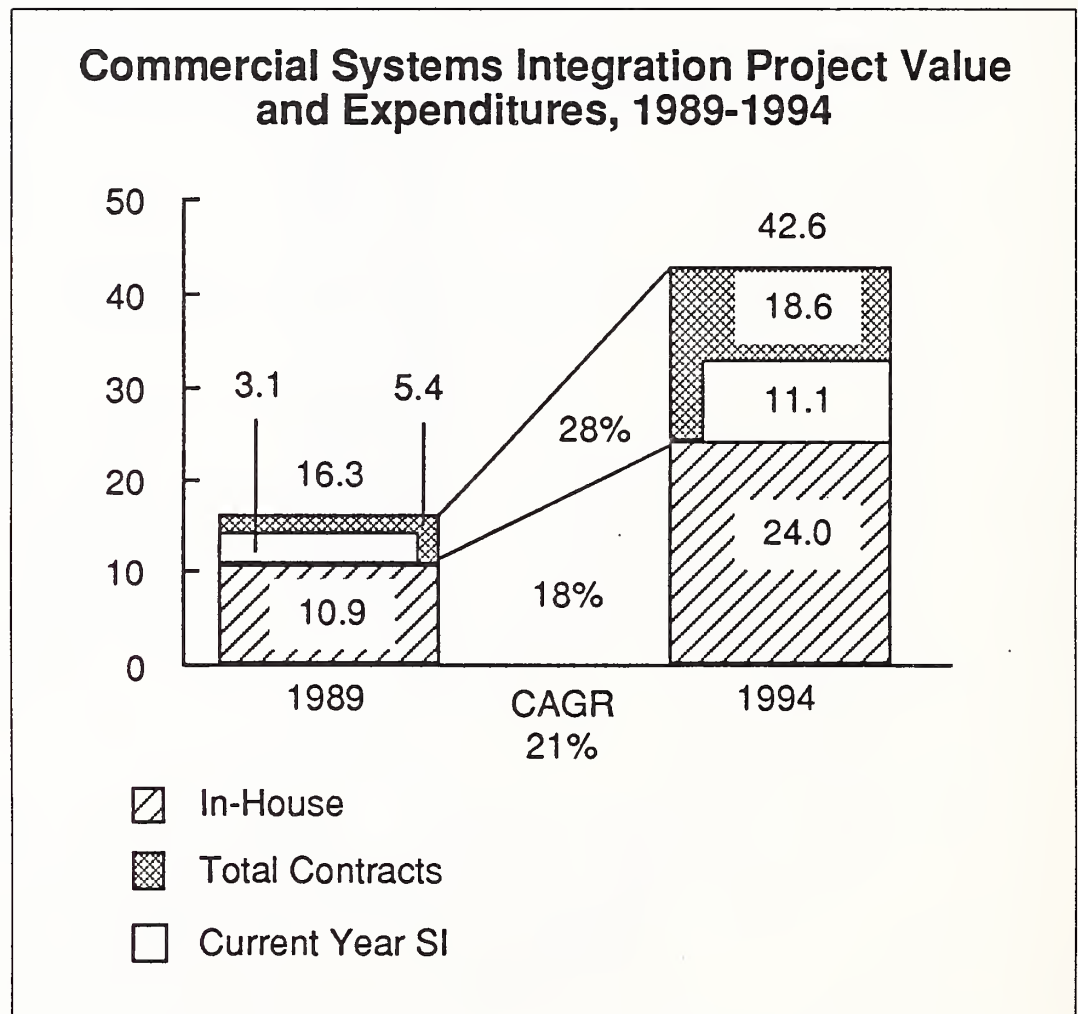


Major changes in the federal government market influence both the 1989 outlay base and the out-year growth prospects. The Gramm-Rudman-Hollings (budget deficit control) Act of 1986 delayed several large SI programs. Awards increased information technology agency outlays by more than \$700 million per year. Out-year prospects were also increased by award of the FAA's Advanced Automation Project to IBM/CSC/Raytheon for \$3.55 billion, to be spent over eight years. Other major programs included the Navy's EDMICS, and SEC's EDGAR programs. Expected contract action on a major overhaul of the IRS income tax system could add another \$900 million in expenditures in this five-year period.

The defense budget cuts for government fiscal years 1990-1991 involve reductions in near-term outlays for several DoD programs, directly affecting federal SI growth. A moderate CAGR of 17% will result in a market of \$6.0 billion in 1994, a reduction of about \$600 million in that year. Even this rate seems somewhat optimistic to some federal budget experts.

INPUT's 1986 and 1988 reports on commercial systems integration estimated the values of outside contracts awarded in each of those years. Also estimated were the expenditures for major in-house projects begun in those years or earlier. Exhibit III-7 shows INPUT's current estimates of both in-house and contracted systems integration spending, as well as the value of contracts signed in 1989. The forecast considers Department of Commerce capital investment data, samples in the SI project data base and the forecast data base used in 1988.

EXHIBIT III-7



INPUT assumes that only the large companies in each vertical industry will use CSI vendors over the forecast period, and that the number of projects will increase with time.

As shown in Exhibit III-7, about \$16.3 billion in projects started in 1989, slightly more than three percent of the \$468 billion of capital investment for the year. The total CSI expenditures for 1989 (\$3.1 billion) are shown for comparison with the value of outside SI contracts let in 1989 (\$5.4 billion). The expenditures include only a small portion of current year contract awards; the major part is the result of earlier contracts.

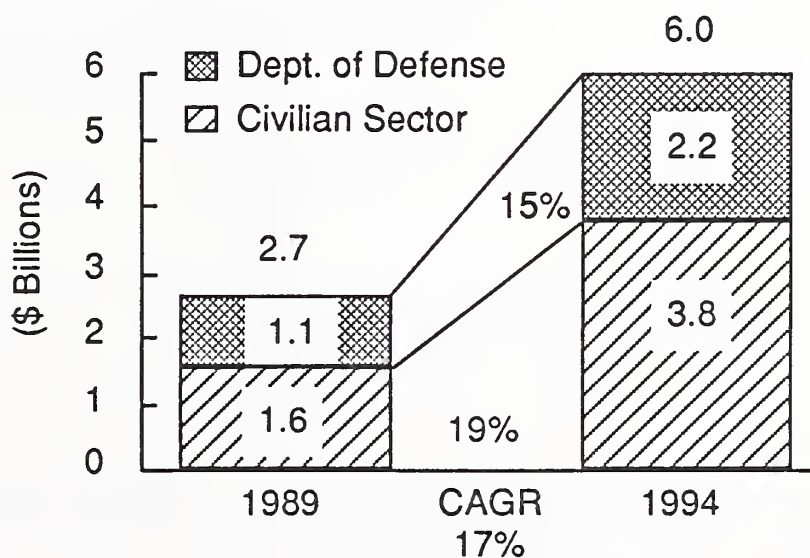
In-house systems integration expenses represent 78% of the total expenditures in 1989. By 1994, this ratio will change to 68% and should continue to decline through the remainder of the decade. The total amount is significant to those who offer both primary and secondary services and products.

The amount contracted per year will rise from \$5.4 billion in 1989 to \$18.6 billion by 1994, at a CAGR of 28%. The latter is only one percentage point less than the growth rate for CSI expenditures. In-house expenditures will grow at a lower compound annual rate of 18%, reflecting the expected shift to outside integrators.

In the federal SI forecast published by INPUT in 1986, the issues included comments that the defense budget growth rate would begin to decline. Ten-year defense forecasts issued late in the Carter Administration noted the declining rate, except for research and development. Earlier in the 1980s, defense began to "catch up" with the civilian agencies in information resource spending to overcome the lean years following the end of the Vietnam War. Since 1987, however, the pendulum of spending for information systems has begun to swing back toward the civilian agencies, as noted in Exhibit III-8.

EXHIBIT III-8

Civilian versus DoD Expenditures for Federal Systems Integration 1989-1994

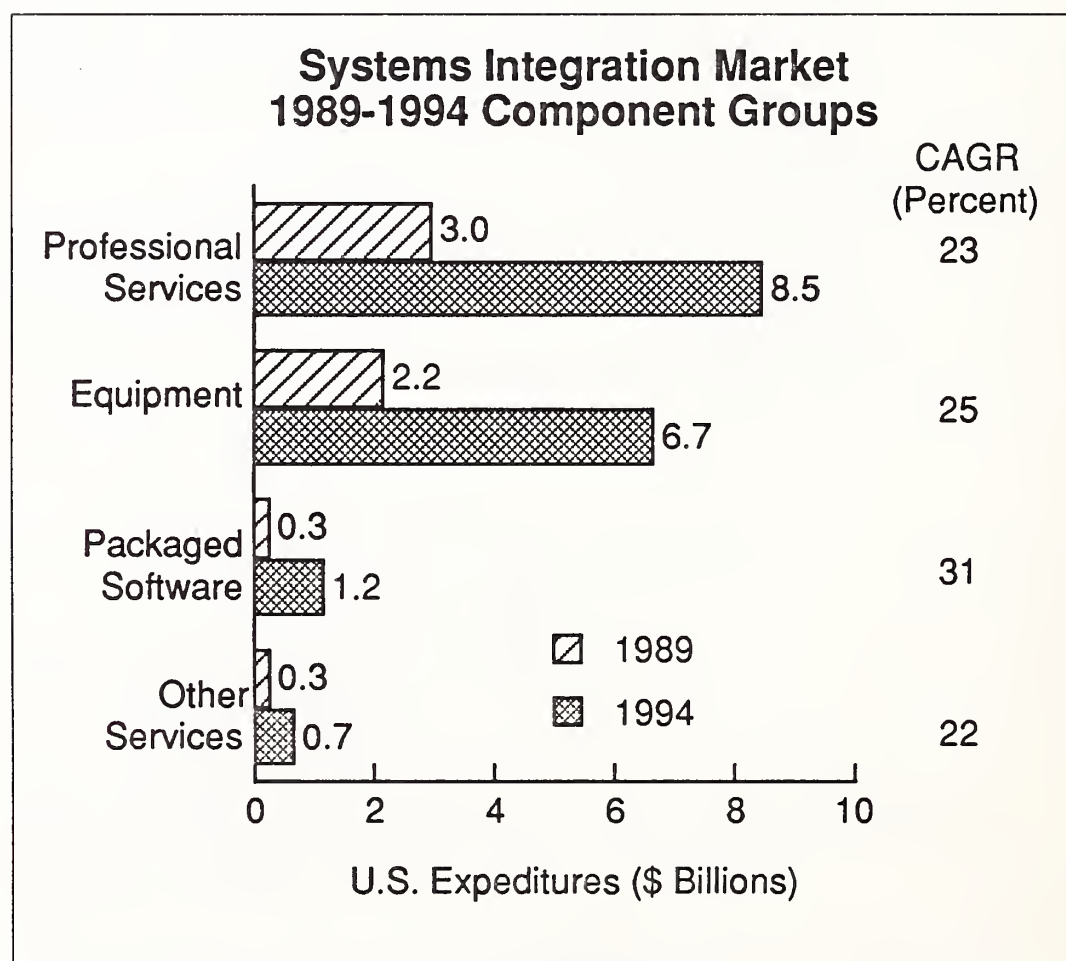


1989 spending by civilian agencies is already 40% higher than defense departments, and is expected to reach \$3.8 billion in 1994. A number of large multiyear civil systems are being implemented for the FAA, Social Security System, NASA and agencies in Commerce. Large outlays are planned for replacements for Justice and Treasury systems in the next five years, which will sustain the projected 19% CAGR. Office systems, graphics systems, CALS and on-demand publishing systems are proposed in defense program expenditures, which will be sustained despite cuts in weapons and platform procurement outlays.

2. SI Component Forecast

The forecast of expenditures by component group appears in Exhibit III-9. Changes in trends between components over the forecast period appear later in Exhibit III-10. The distribution of component spending in the separate commercial and federal sectors is illustrated later in Exhibits III-11 and III-12.

EXHIBIT III-9



The professional services and equipment components dominate the spending for systems integration, with professional services expenditures leading in 1989 (a change from the 1988 forecast).

This difference results from a change in the federal SI component structure in the forecast that brings this report in line with the forecast in INPUT's report, *Federal Systems Integration Market, 1989-1994*. This change results in a federal component distribution that is similar to that of the commercial markets.

In the professional services component, software development is the predominant service required, although SI clearly requires the other components: consulting, project management, design/integration, education and training, and operation and maintenance. The additional elements of the four components, listed earlier in Exhibit III-1, will be briefly discussed below.

a. Equipment

Information systems and communications equipment is currently the second largest component of SI expenditures (39%), and is expected to remain at this level through 1994, as shown in Exhibit III-10. By its very nature, SI is equipment-intensive and hardware price/performance gains that would seemingly reduce the hardware component will be offset by productivity improvements in programming technology and the increased use of packaged software, particularly in the commercial market.

Some projects may require special-purpose computer and communications-related equipment (vector or array processors, RISC machines, or specially designed workstations), but this should not have a material impact on the overall allocation for "run-of-the-mill iron." The leading industries in hardware expenditures are discrete manufacturing, state and local government, banking/finance and utilities.

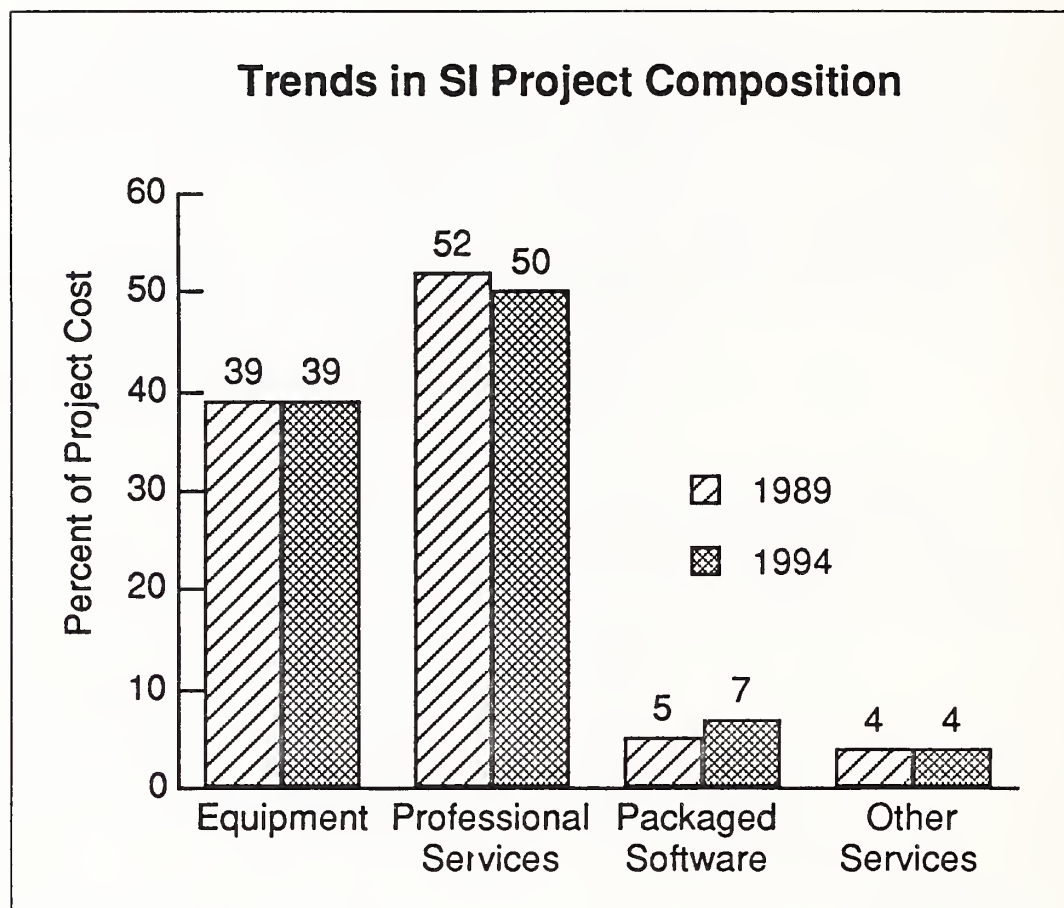
The SI equipment category excludes custom turnkey systems by SI definition. CSI projects, in the early years at least, will be rather conservative in nature. It is likely that "leading-edge" technology will, in many cases, be avoided.

New communications demands, including extensive networks, are expected to remain high throughout the forecast period. Part of the demand is a result of networking PCs and workstations to mainframes, a growing element of integration activities.

An equally important development is the transition from cable and wire to optical fiber and the addition of computer-based network monitoring and management systems. The leading industries in communication equipment expenditures are banking/finance, discrete manufacturing, and state and local government, respectively.

New applications are emerging as well. Electronic data interchange (EDI), electronic mail, teleconferencing, telemetry applications (remote

EXHIBIT III-10



diagnostics and meter reading), new consumer-oriented applications in POS, and credit card authorizations head the list of applications that require adaptive technologies combining the utility of point-to-point communication with the specific communication requirements of the application.

b. Professional Services

The largest ingredient of SI projects is professional services, the “value-added” component that adapts hardware and software to the task assigned. In earlier forecasts these services were a smaller component than equipment, but they are now clearly leading and will continue to lead, as shown in Exhibit III-10. The percentage of this component will slip slightly over the forecast period, offset by an increase of packaged software, predominantly in the commercial sector.

In the vertical markets, expenditure is more a function of the overall level of CSI activity in the industry. With only a few exceptions, discrete manufacturing firms should account for the most professional services expenditures. Other industries with large professional services expenditures include, in descending order, state and local government, banking/finance, utilities, insurance, and retail distribution.

Consulting services are frequently the precursor of most systems integration projects. Overall planning assistance, feasibility studies, and cost-effectiveness/trade-off studies guide the client in planning for the desired solution. Consulting services can also support vendor sales through in-depth knowledge acquired during the consulting engagement. Some clients separate consulting from project implementation. Others do not, and some use consultants to aid them during project development and implementation.

Fees are paid to the integrator for planning, scheduling, and controlling the materials and human resources required for the execution of the project. Program management (PM) involves the coordination of complex activities to meet time, cost, resource allocation, and performance targets. It also involves reporting on these activities to keep the client informed of progress.

Management fees compensate the SI contractor for assuming the risks involved in guaranteeing the success of the solution. Again, discrete manufacturing leads in PM expenditures, followed by state and local government, banking/finance, and insurance.

Another role of the integrator or one of its subcontractors is the actual technical integration of the system's components. Design/integration services include systems design, integration of computing components, installation, and client acceptance tests of the data processing and communications systems. As noted earlier, discrete manufacturing is the leading industry in expenditures for this subcomponent, more than twice the level of state and local government and banking/finance.

The development of new custom software, the conversion of existing software, and the modification of commercial software packages are key professional services. Though the work is essentially programing and analysis, it occasionally includes independent verification and validation of the new system and software maintenance of that system for a specified period of time.

The level of these services varies between industries, but the leaders now appear to be discrete manufacturing and state and local government. Banking/finance and utilities are next, but at only about half the level of state and local government.

Education and training of the client staff on operation of the system, as well as full documentation of the system's operation and maintenance, are also critical to the success of the project. Overall expenditures in this category are low, however, because hardware vendors provide many of these services on a customer service basis, built into the component prices.

Some major projects include a requirement that a vendor operate and maintain the developed system for a specified period of time. Under some contracts, the maintenance is under warranty for a defined period. Under others, operation and maintenance is a specifically negotiated arrangement that covers the transition of the system from the vendor(s) who built it to the client who will use it.

c. Software Products

Packaged software does not represent a major expenditure in most CSI projects. While IS managers have been demonstrating a propensity to buy packages rather than pay for unique, custom development of software, the fact is that CSI projects by their nature preclude extensive use of these packages.

As indicated in Exhibit III-9, software package expenditures will grow at a CAGR of 31%. However, as seen in Exhibit III-10, the annual expenditure will continue to amount to only 7% of the total SI dollars.

The leading industries in software product expenditures are, as expected, discrete manufacturing, state and local government, and banking/finance, in that order. Education and medical industries will spend the largest portion of their project costs on packaged software.

Projects focus on applications rather than the computer environment in which those applications will run. Accordingly, applications software is expected to outpace systems software throughout the forecast period. SI projects are typically focused on core business areas (market support systems, product development and manufacturing, inventory management, customer service, etc.) and would seem to be targets for the development of applications software that can be customized to meet specific customer needs. INPUT believes, however, that clients will continue to reject packaged applications as not able to meet unique needs.

The leading industries in software product expenditures are, as expected, discrete manufacturing, state and local government, and banking/finance, in that order. The education and medical industries will spend the largest portion of project costs on packaged software.

d. Other Services

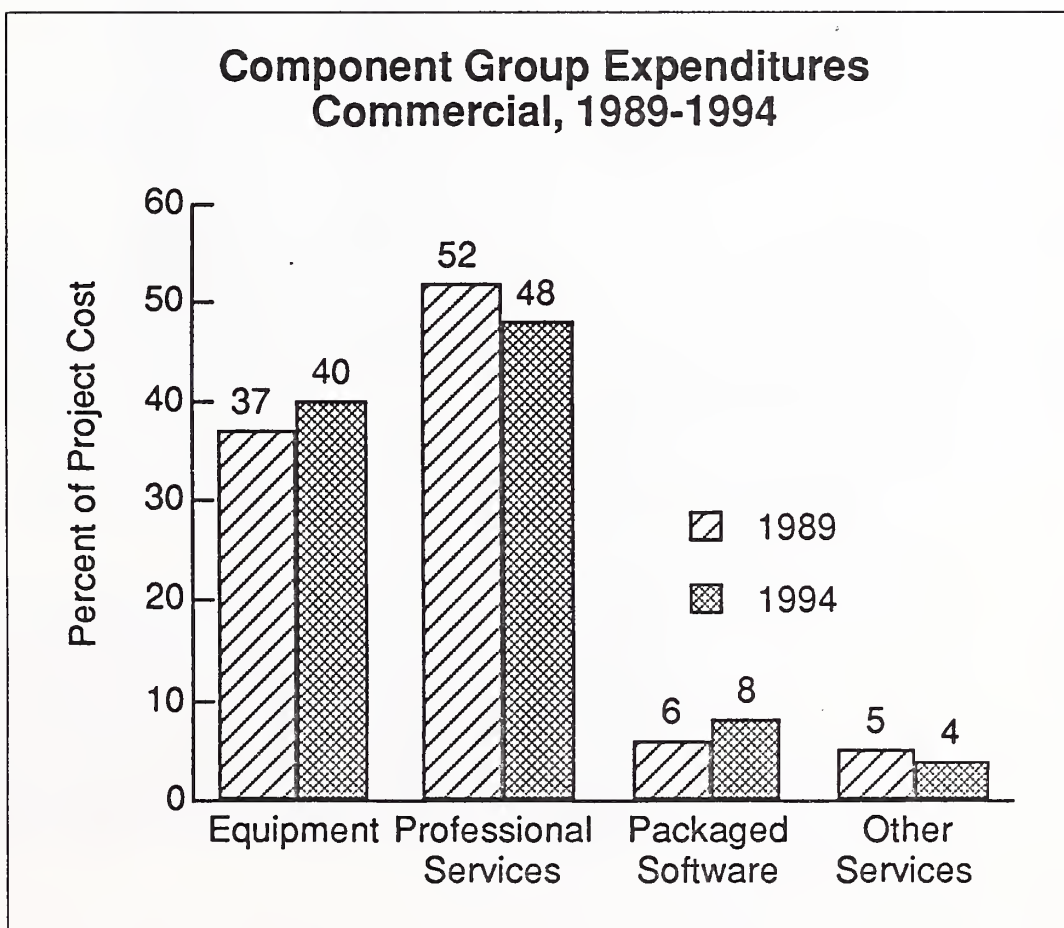
Most projects include other product and service expenditures that are not easily classified elsewhere. This category includes miscellaneous items such as engineering services, automation equipment, computer supplies, business support services and supplies, and other items required for a smooth development effort. Processing and network services and communications services that may be required during the course of development are also included in this category. Other than the federal govern-

ment, the leading expenditures for this component will come from discrete manufacturing, state and local government, and utilities. Spending for this component will remain at 4% of the total composition over the forecast period.

e. Component Group Expenditures—Commercial versus Federal

SI component expenditures in the two major market sectors are distributed quite similarly in the 1989 forecast. In 1989, the commercial market was distributed as shown in Exhibit III-11. Professional services, at 52%, made up the largest percentage of the total and will only drop slightly to 48% in 1994. This change will be offset by an increase in equipment and packaged software spending. As mentioned earlier, there will be some gains in the acceptance of replicatable software frameworks and packages, although custom programming will remain the source of the majority of SI program development.

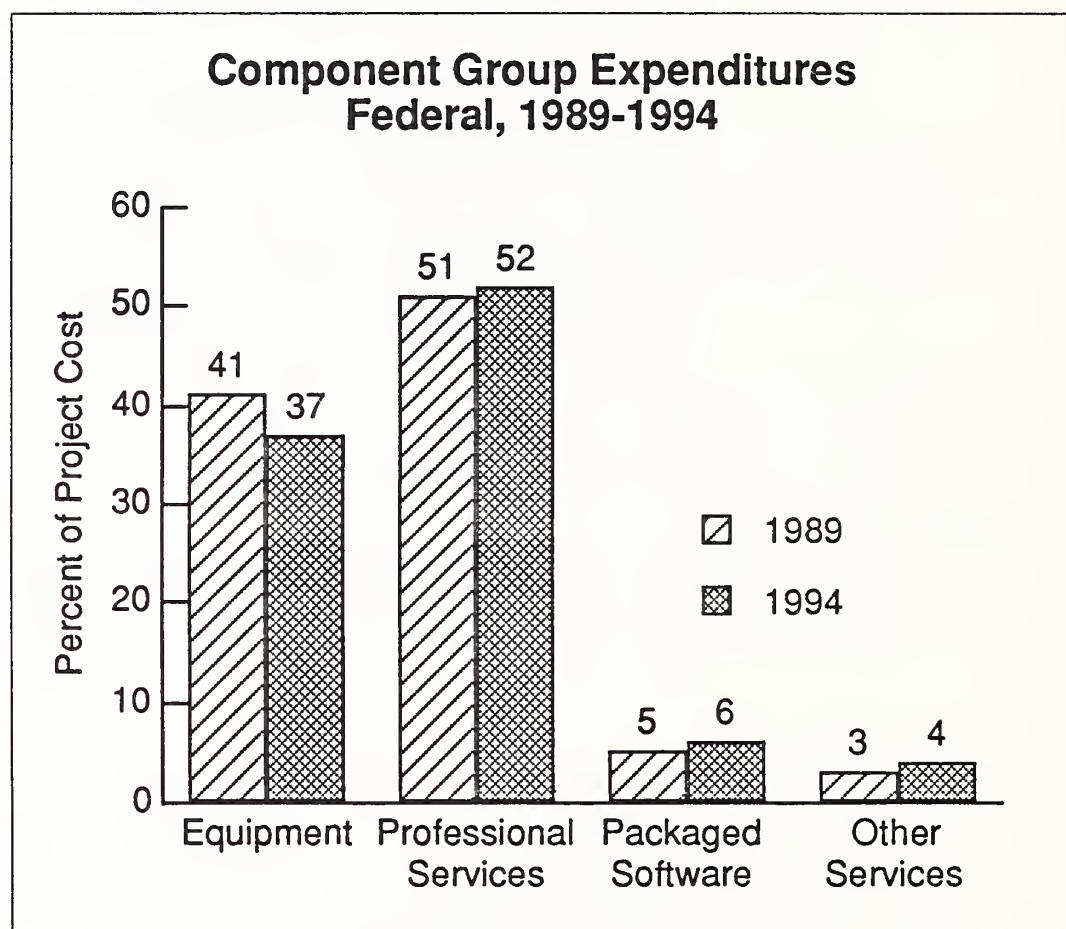
EXHIBIT III-11



In the federal market, component expenditures are distributed somewhat differently than the commercial market, as shown in Exhibit III-12. Professional services expenditures are again the leader at 51% in 1989, and over the forecast period they will grow slightly to 52% of total

spending. Equipment expenditures will decline from 41% to 37%, due to extensive discounting that occurs as a result of economies of scale in traditionally large federal projects and the extreme competitiveness of this market.

EXHIBIT III-12



The software component in the federal market is smaller than in the commercial market, primarily in the application software area. Federal business processes are different enough from commercial ones that, in many cases, application software developed for commercial organizations is not transferable to federal organizations. In addition, the smaller size of the federal market generally does not support the development and sale of unique application software packages.

3. Forecast by Industry

a. Annual SI Expenditures

The annual expenditures over the forecast period in the federal government market will grow from \$2.7 billion in 1989 to \$6.0 billion in 1994, at a CAGR of 17%, as shown earlier in Exhibit III-6. Breakdown of the forecast by key agencies and major projects is provided separately in INPUT's report, *Federal Systems Integration Market—1989-1994*, published in 1989.

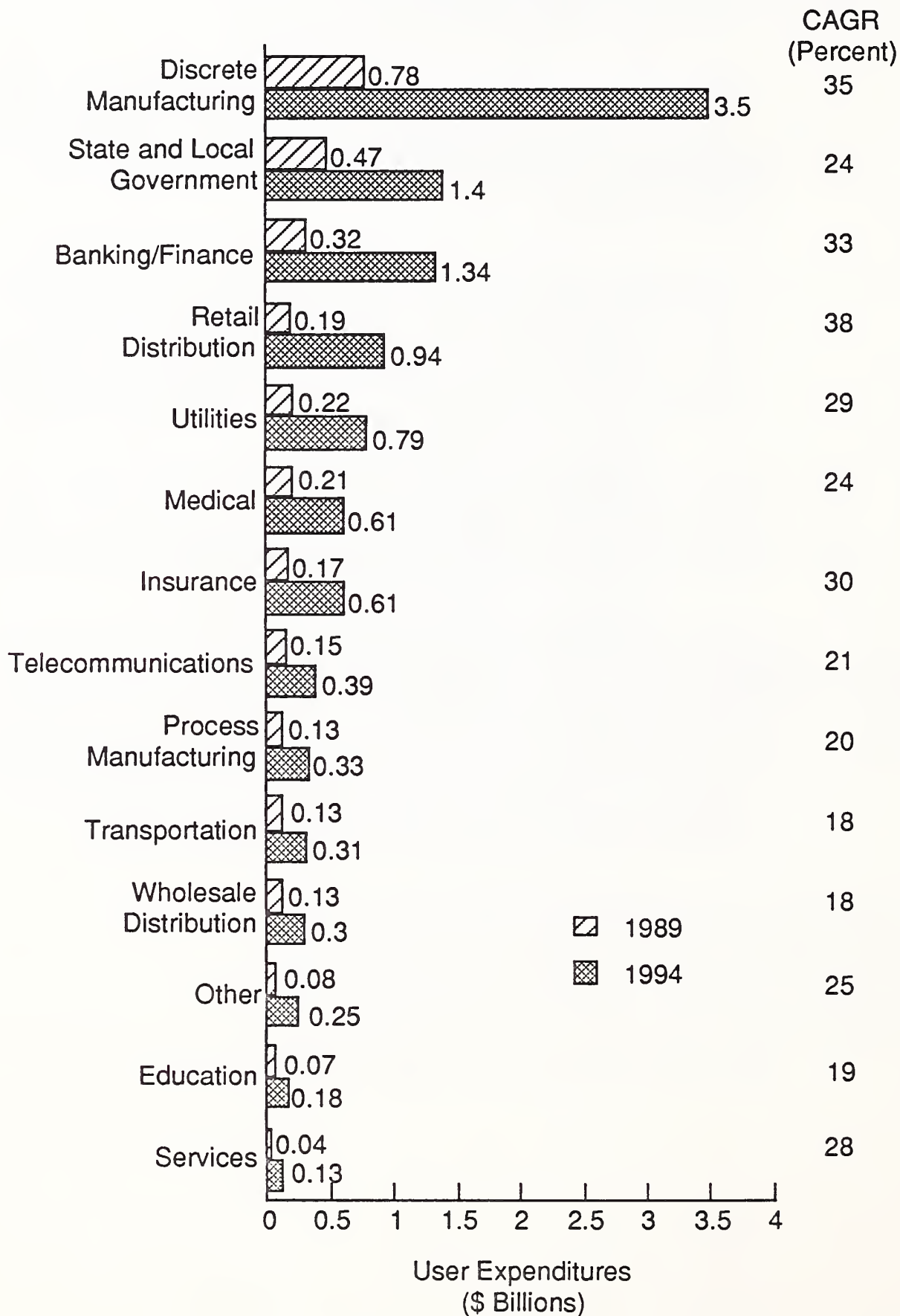
The annual expenditures by commercial vertical industry market for the same forecast period are displayed in Exhibit III-13 and examined by component expenditures and key opportunities in Section IV of this report. The top three industries—discrete manufacturing, state and local government and banking/finance—account for more than half of the total commercial systems integration expenditures over the forecast period.

Ranked by rate of growth, retail distribution leads with a 38% compound annual growth rate, followed by discrete manufacturing at 35%, and banking and finance at 33%. The rapid growth rate of discrete manufacturing expands its absolute lead over the second and third largest markets, state and local government and banking and finance.

At the other end of the growth rate scale, the wholesale distribution and transportation markets are expected to grow at 18%, and education at 19%. Wholesale distribution operates on very narrow margins, which limits its ability to invest in customized systems solutions. The transportation industry continues to have problems adapting to deregulation while facing rapidly increasing costs and competition. Though these factors should encourage additional automation, low profit margins and difficulty in attracting capital lead to a CAGR of only 18%.

EXHIBIT III-13

Annual CSI Expenditures by Industry 1989-1994



b. Annual CSI Contract Award Values

The total contract value of CSI projects, (the value of new projects awarded in any year), is forecasted to grow from \$5.4 billion in 1989 to \$18.6 billion in 1994, at a CAGR of 22%. As could be expected, the leading five industries in total annual awards are the same as those in annual expenditures, as illustrated in Exhibit III-14. The last three industries are the same.

The difference between annual expenditures and annual awards does not bear a direct relationship. The expenditures include outlays for contracts awarded in one to three preceding years, and only a portion of the expenditures from awards made in the current year.

The growth rate of awards differs from the rates of annual expenditures because some industries use shorter contracts, and others implement SI projects in phases or smaller segments. Many of the users indicated a preference for smaller projects that could be more readily monitored, and would cause less displacement of the business during implementation.

The current examples in the SI project data base includes shorter term contracts that have been or were expected to be implemented in less than three years, and a few very large contracts that have terms of more than four years. The opportunity types and ranges associated with each vertical market are discussed in Section IV.

C

Key Marketplace Factors

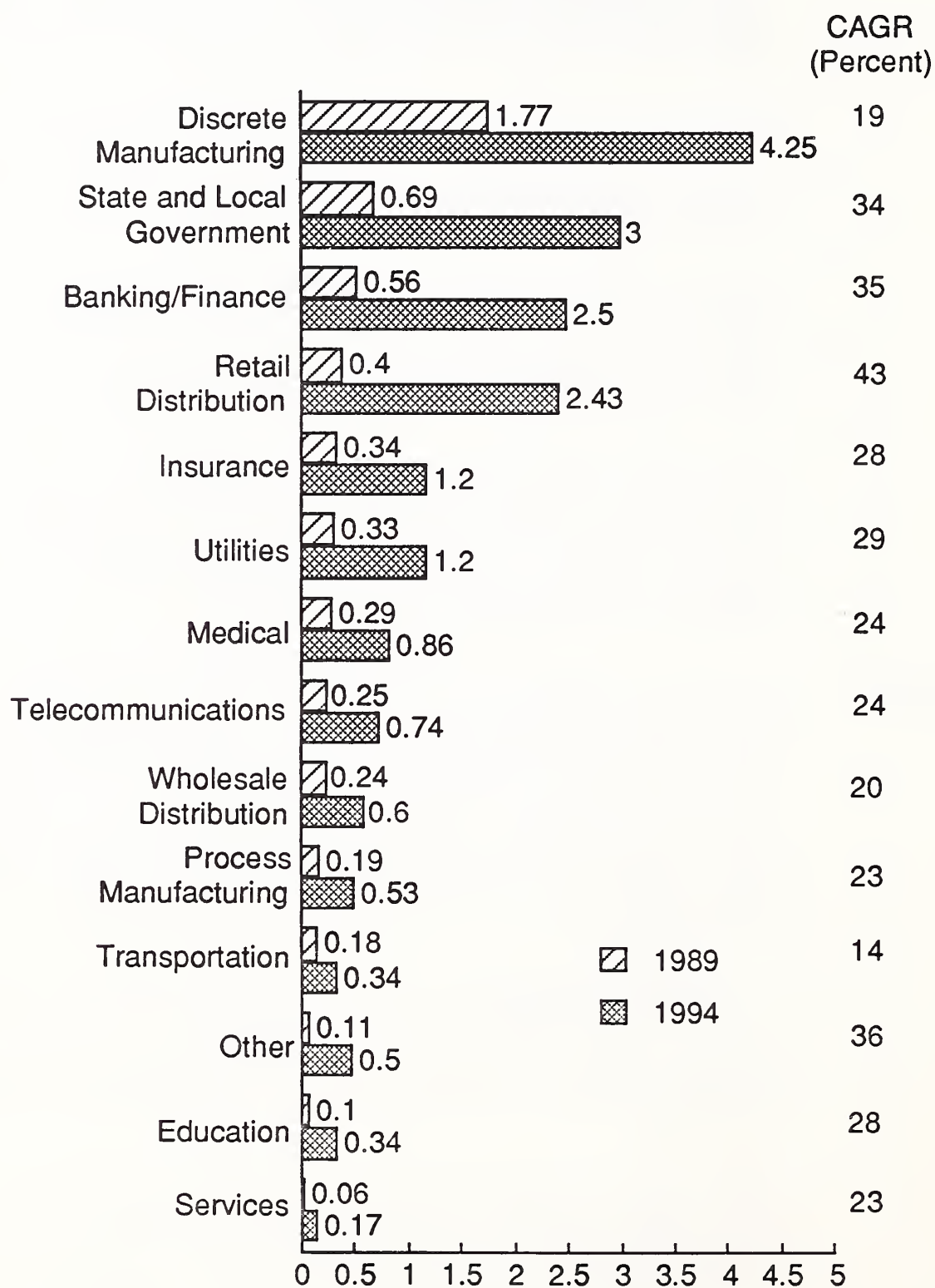
From the vendor point of view, systems integration projects represent new or additional opportunities for revenue. SI opens new distribution channels for the sale of products and services. Prime contractors gain additional income from fees for managing the entire program and the work of subcontractors. This income includes markups on products and services, and some vendors also receive revenues and profits from the add-on effort of operating and maintaining the systems after implementation.

A close business relationship develops between the integrator and the client, and increases the integrator's understanding of the client's business needs. This involvement can assure the integrator an "inside track" for providing future software and services, including some not related to the SI project.

Strategically, the SI client may be a different class of buyer for the vendor. With decision making placed higher in the client's executive management and in user organizations, the vendor needs to increase exposure at all levels in the client's organization. Clients typically need to be sold on the vendor's knowledge of the client's business problem and proposed solution, the vendor's overall capabilities, and its experience and success in implementing complex systems integration projects.

EXHIBIT III-14

Total Annual CSI Contract Award Values by Industry, 1989-1994



This subsection explores the key advantages and obstacles, current and future, to vendors in the SI market, from the perspectives of clients and vendors.

1. Key Commercial SI Market Factors

The development of major systems by integrators has been common practice in the federal government sector for more than thirty years. The commercial sector has begun to use outside vendors for integration only in the last few years.

There are both positive and negative factors affecting the growth of the systems integration market. They are outlined in Exhibit III-15. INPUT believes that the positive factors will clearly outweigh the negative ones and forecasts that the market will expand over the next decade.

EXHIBIT III-15

Key Commercial SI Market Factors

- Positive
 - Rising demand for connectivity
 - Major rebuilding of infrastructure
 - Growing user management trend
 - Global competitive pressures
 - Growing complexity of applications
- Negative
 - "In-house" competitive threat
 - Growing concerns over maintenance issues
 - Organizational instability
 - "Wait-and-see" track records

On the positive side, the most significant factor is the rising demand for connectivity between business elements, trading partners, customers, and sources of supply. In addition, SI addresses incompatibility among various vendors' equipment and protocols and provides cost-effective solutions and implementation of network management systems, when needed.

The time value of information has become as critical to business as the time value of money. An important information systems management focus is the rebuilding of major network and data infrastructures to provide the flexibility and capacity to satisfy new user requirements for business support systems.

The growth of global markets and competition is forcing business to improve its ability to operate in real-time mode around the clock and around the world. Most business systems cannot meet the requirement of continuous operation. New solutions to cope with new problems require tools and technologies that are beyond the scope of equipment and applications that are just a few years old.

Some basic attitudes hinder the implementation of integrated systems. In some major organizations, corporate management views the in-house staff as qualified and sufficient to plan and execute important information system improvements. Though some organizations do have the skills to implement complex systems, many are overloaded with the maintenance and operation of existing applications, and/or lack the skills to integrate new technologies or implement advanced applications.

Also detracting from a decision to employ a systems integrator is the concern about maintaining software programs developed by others. Although this might have been a concern in the past, years of professional services experience and proven documentation techniques should override this consideration. In addition, many integrators will provide ongoing maintenance and systems operations.

Organizational instability, the bane of many medium-sized and large businesses, can delay plans to upgrade or replace existing data processing resources indefinitely. "Wait and see" attitudes are likely to be the most difficult obstacle for vendors to overcome.

2. Key Federal SI Market Factors

Systems integrators have found advantages to working with the federal government that outweigh the many unique and difficult practices and competitive stresses. With little or no ADP staff growth, agencies look to industry to provide the answers—and systems—to help satisfy steadily increasing demands. The agencies specify details of the solution and employ a variety of monitoring practices. The government shares implementation risk with the vendors. Equally important, the administration openly supports technologically based upgrades, under REFORM 88 and other initiatives. Exhibit III-16 identifies the major federal SI market factors.

EXHIBIT III-16

Key Federal SI Market Factors

- Positive
 - Demand for productivity improvement
 - Shortage of technical staff
 - Shared implementation risks
 - Trend toward technology upgrades
- Negative
 - Deficit and budget pressures
 - Systems maintenance resource burden
 - Slow standards implementations
 - Extended implementation schedules

There are some concerns about the state of this market under a new administration and a single-majority Congress. Severe cutbacks may be ordered to satisfy budget limitations and the requirements of the Gramm-Rudman-Hollings Act.

For some vendors, failure of the government to impose standards has been a boon to competition; for others it has produced an element of uncertainty. Repeated extensions of implementation schedules, especially for medium-to-large multisite projects, may lead to project cancellation. Funding can disappear, requirements can change drastically, or the project can be totally eliminated.

3. Major Buyer Issues

Earlier surveys conducted by INPUT produced a variety of client reactions to contracted systems integration projects. The initial report of the 1988 SI Program, *Buyer Issues*, provided a more focused view of buyer concerns. The research confirmed rising management expectations in many industries. Some executives brushed aside in-house proposals and contracted for major solutions. The objective was getting the system on-line early and with minimal modification. Users wanted systems that performed functions for them without direct involvement of the IS staff.

The 1988 report also reported that corporations wanted information executives (CIO-Chief Information Officers) to manage the technology investment and oversee building of new systems. The more astute IS managers recognized the urgent need for infrastructure integration, to provide capable platforms for supporting new demands. Businesses were also identified as moving from general data processing to decision support and control systems that would provide them with an appropriate competitive edge.

Though these buyer issues still hold true, there are a number of other related issues, shown in Exhibit III-17, that have become apparent in 1989. U.S. business, more than ever, is feeling the pressures of competition from both domestic and foreign companies.

These competitive pressures are forcing organizations to look closely at their core business to identify business solutions that can differentiate their products and services from the competition. In many cases, the application of technology can make the difference in offering a superior service faster or reducing the length of product development cycles. These solutions are increasingly complex, as they change business processes and often are required to operate worldwide.

EXHIBIT III-17

Major Buyer Issues—1989

- Competitive demands
- Core business focus
- Users becoming buyers
- Increasingly complex solutions
- New technology application
- Unavailable skills

As INPUT has studied information systems budgets, it has become apparent that an increasing amount of information systems expenditure is no longer controlled by internal IS organizations. This is because user organizations are clearly becoming the buyers of IS solutions and control the budgets for them. Many of the solutions they seek include new technologies such as artificial intelligence, image processing, and a variety of the advanced telecommunications alternatives such as LANs, WANs, and MANs.

Systems integrators with good track records provide an attractive alternative to internal IS organizations, which often lack adequate resources and skills to meet users' requirements. Some of these internal organizations also lack application knowledge and experience in the solutions that are sought.

These trends continue to provide opportunities for SI vendors and support significant growth for this new service. Failure to perform is the major factor that can slow its acceptance.

4. Major Vendor Issues

The 1988 SI market analysis also identified a number of major vendor issues which are still important and are discussed briefly here. A key concern was and is the ever-present potential of catastrophic failure, and eventual litigation, damaged image, and rising liability insurance premiums. Coupled with this concern was the all-too-frequent resistance to change from in-house integrators, who perceive the vendor as an interloper in their territory.

Increasing competition for significant projects and the rush by clients to upgrade the solicitation rules and terms and conditions resulted in confusion for both client and vendor. There was also a great deal of concern expressed regarding the desirability of alliances and how to operate effectively with other vendors who are allies one day and competitors the next. Medium-to-large SI vendors also had serious reservations about the introduction of leading-edge technology in projects. It increases the potential for project delays, cost overruns, or nonperformance of stated specifications.

A number of new vendor issues have emerged in 1989. They are identified in Exhibit III-18. Systems integration has become an increasingly popular service offering for many of the reasons described earlier in this report. Vendors continue to recognize the importance of this channel for the delivery of their products or services. With this recognition comes the need to establish the basic resources to compete effectively either internally or through consolidation or alliances with other vendors. If the skills are to be provided internally, there is the problem of attracting and retaining qualified personnel, particularly qualified program managers. These individuals have the unique skills to manage successful installations; without them, vendors' risk of failure increases. As a result, there is a great deal of competition for qualified SI personnel.

Because of the increased participation in the market, there is also increased competition for clients. When the market was new it was relatively uncrowded. With the recognition that SI is an important delivery channel has come a wealth of new market entrants, and the competition for clients has heated up.

EXHIBIT III-18

Major Vendor Issues—1989

- Increasing competition
 - Skills
 - Clients
- Full service suppliers
 - "Business change" consulting
 - Systems operation
- Investment in repeatable solutions
 - Risk reduction
 - Productivity
- Consolidations and alliances

There is an emerging trend in the market for large vendors to become "full service providers" with complete offerings from front-end business consulting through systems integration to follow-on systems operations. Full service offerings allow a vendor to capture a client through the entire development and operations cycle. One fundamental issue that vendors must address is how to compete effectively in a market that appears to be moving toward the full service provider.

The role of business consulting in systems integration is worthy of additional comment. As users focus on their core business and solutions to improve their competitiveness in their markets, they often seek business consultants to assist them in changing their business processes.

The consultants' recommendations often lead to SI projects and contracts. There is a growing belief and recognition that vendors that provide business consulting are in the driver's seat when it comes to awarding the implementation contract. A growing number of vendors are examining if and how they should participate in front-end business consulting.

An additional vendor issue is the need and advisability of investing in repeatable solutions. These products can become the framework for customized SI solutions and result in improved professional productivity and reduced risk of failure. Some vendors are investing in frameworks

and architectures, while others prefer to work with the customer to provide a unique solution.

Consolidations and alliances remain an important vendor issue in the SI market. Many concerns are voiced as the market becomes cluttered with alliances. Both alliances and acquisitions are dependent for success on a number of factors. These relationships need to be monitored and managed carefully, and even then they may not be successful.

The concern about alliances is that today's ally may become tomorrow's competitor. Now armed with the vendor's business strategies and appraisal of inside skills, the previous ally becomes very dangerous. The potential for accidental exposure of pricing strategies threatens the prime contractor, partners and suppliers.

There are several other issues included in INPUT's Western Europe SI report that are worthy of repetition. They are identified in Exhibit III-19.

EXHIBIT III-19

Western Europe SI Vendor Challenges

- System integration bidding
 - Costs
 - Skill set
- Product management
 - Managing the user
- Risk containment
 - Cost premium
 - Companywide responsibility
 - User benefit

Two elements related to bidding are of serious concern. They are a vendor's costs and skill set. These are affected by the client's perception of what is acceptable and the direction taken by the competition. Even in sole-source contracts, there is a limit to the price the client will pay.

The vendor must trade off between product and service costs and the sale price. The level of the skill set used is a trade-off between cost realism and the quality to ensure success. Project management is a key issue to the user/buyer, as well as to the vendor. Managing day-to-day relations with the user is frequently essential to successful completion of the project.

Risk containment is a major challenge to federal clients as well as to vendors. In the commercial sector, the cost of liability insurance will reflect the vendor's past performance compared to his competition. Cost and resulting risk control measures must be part of the SI project management procedures, applicable to all of the SI vendor's staff.

Few vendors have all of the necessary skills to meet all of the specifications required to provide a fully rounded proposal to the client. Many companies, however, have entered into alliances without having thought out a workable arrangement in advance. Exhibit III-20 lists typical problems that plague vendor alliances, as described by Dr. Michael Koza in the midsummer 1988 INPUT SI seminar.

EXHIBIT III-20

Problems of Vendor Alliances

- Impact of environmental forces (\$)
- Short-term differences in performance
- Perceived versus actual benefits
- Unwillingness to share key assets
- Difference in culture

Throughout an alliance there can be doubt about the ally's commitment to the success of both parties. This leads to an unwillingness to share key information with the ally. One or both of the parties may not realize the benefits that were seen as the basis for forming the alliance. The impact of differences in business, sales and management cultures has been traumatic in several failed alliances.

There is never any assurance that alliances will work for both parties. Prospects for making them work for short periods can increase with proper planning and discussions.

Allies need to negotiate and clearly state objectives before the agreement is confirmed. Objectives should not change before some minimum period passes. Early changes invariably lead to trouble. Strategy, objectives and procedures must be communicated to the operating staff as well as management. Dr. Koza suggested that partners should think at the time of confirmation about how and when to dissolve the alliance.

5. Future SI Market Trends

An important element of vendor strategy development is assessing the impact of future market trends on goals and objectives and strategies to achieve them. Though there are several trends worthy of assessment, Exhibit III-21 lists those with the most significant potential impact. Strategies to deal with these trends appear in Section V.

EXHIBIT III-21

Future Trends

- New domestic and offshore competitors as primary and secondary vendors
- Increased centralization of vendor SI "product" management
- Focus on program management techniques and development methodologies
- Growing marketing/promotion investment
- Formal market strategy development by non-SI vendors
- Expanded service offerings

The projected growth and expected pervasiveness of information systems integration activities in most lines of business, academia, and government have attracted the attention of a new generation of domestic and offshore competitors. Management consulting, aerospace, and defense firms are also looking to commercial SI as a needed growth opportunity.

Additional information industry participants are seeking or announcing entry into the market. A number of federal vendors, such as Lockheed and Grumman, have announced their entry or interest in entering the commercial SI market.

Telecommunications organizations still haven't reached consensus about if and how they should participate in the market. Some, such as Ameritech, Cincinnati Bell and NYNEX, are aggressively participating in the market, while others are still taking a "wait and see" attitude. Organizations in Western Europe and the Pacific Rim (particularly Japan), are forming alliances with major U.S. vendors and are quietly monitoring the market to determine how they can enter, and the resources needed to participate.

A widening range of vendors have begun to centralize their SI skills and management. The objectives include developing a "critical mass" to perform the tasks, providing a publicly supportable image as an SI vendor, controlling costs, and providing enhanced visibility of project progress.

Program management is clearly the key ingredient for successfully satisfying contract requirement on time and within budget. A few well-publicized "disasters" in implementing total solutions emphasize the importance of well-disciplined management techniques. Vendors will focus on this important aspect of SI and the vendors with superior systems will be more successful. Investment in developing and improving program management techniques will provide returns in both profits and reputation of success. Investment in end-to-end development technologies will be equally important in improving productivity and bid win rates. CASE will play an important role in this area.

More vendors have begun to recognize the need to promote their SI and/or SI support capabilities and successes, especially in the CSI market. The approach that gives solutions to business problems will gain favor because it appeals to higher-level nontechnical management.

Vendors who are not identified with the SI market are expected to develop market strategies to enter or widen their position in the market. Some will approach known competitors. Others, with unique products or services, will address prospective clients directly, hoping for a directed position in the contract.

Current market participants are expanding the range of services and products they offer, to increase their share of information services revenues. Computer vendors and professional services firms are expanding their offerings from business consulting through systems operations. The large vendors are aggressively attempting to become "full service providers," as discussed earlier, and to capture clients for the full range of "outsourcing" services.

D**Competitive
Environment**

The attractiveness of SI's potential for revenue growth, account control, and as a distribution channel for existing products and services, leads sizeable numbers of vendors to claim that they are systems integrators. Few are truly integrators able to plan and manage major projects that result in successful delivery of desired solutions.

A large number of vendors participate in each of the information service industry delivery modes. CSI is no exception and is rapidly becoming populated by a broad range of participants.

Casual participation by any serious vendor is very unlikely. The promise of rapid growth in the SI market attracts large and respected competitors. The combination of newness, large competitors, and intrinsic tensions on the customer side, however, result in very demanding market conditions.

Since no firm has a franchise in this market, the opportunity exists for vendors to create niche markets from their particular position of strength. The result will be strategic alliances among different classes of vendors.

INPUT identifies the leading competitors in 1989 by revenue, market share and by vendor class in this report subsection. Opportunities for secondary SI market vendors are also discussed.

A separate report, *Systems Integration Competitive Analysis*, provides an in-depth analysis of the competitive position, market penetration plans, industry focus, strategies, strengths and weaknesses of the key SI vendors.

1. Market Share

INPUT estimates of vendor market share in 1989 appear in the next three exhibits. To develop market share data, INPUT interviewed the major vendors in the market to obtain their systems integration revenues. In a few cases, vendors were unable or unwilling to provide this data and INPUT estimated their revenues based on its knowledge of the market.

Another factor that should be considered in examining this data is that the revenue data provided in many cases represents double counting of end-user expenditures. For example, a prime contractor that holds the contract with the buyer will include the payments for all of the project products and services in its revenues.

Subcontractors who are managed by the prime contractor and provide products and services to the contract will measure payments they receive from the prime contractor in their revenues. In many cases multiple levels of this subcontracting occur and the original user expenditures are

further inflated by looking only at vendor revenues. INPUT measures end-user expenditures when measuring and forecasting markets, as this provides a view of the maximum revenues available to any one vendor. INPUT does not attempt to eliminate double counting from vendors' revenues.

EXHIBIT III-22

U.S. Systems Integration Market Share 1989

Vendor	Share (Percent)
IBM	15
Andersen Consulting	9
EDS	9
CSC	6
Unisys	6
DEC	5
SAIC	5
Martin Marietta	5
CDC	4
BCS	4

There have been some interesting changes in vendor ranking in the total U. S. market since 1988, as seen in Exhibit III-22. Andersen Consulting is ranked second with a market share of 9%. It is important to note that Andersen SI revenues exclude equipment revenues. INPUT believes that Andersen's revenues would exceed \$1 billion if the equipment expenditures in their projects were included in their reported revenues. This would rank them as number one in market share rather than number two.

New entries to the top ten vendors include Digital Equipment and Martin Marrietta. Digital has placed great emphasis on the SI market; it has won and is implementing a sizeable number of SI projects. Martin has moved to the top ten as a result of both SI growth and reporting all of its SI activities, rather than just those of its Data Systems organization. Dropped from the top ten are Black and Decker, formerly Emhart (PRC and ATI), and Grumman.

Grumman has reclassified its Data Systems Divisions activities, and some revenues that were formerly considered SI are now classified in other information services delivery modes. Grumman, whose integration activities have been limited to the public sector, may return to the top ten, as a spokesman has indicated that it is considering entry into the commercial SI market in the 1991 timeframe.

TRW has not been included in INPUT's rankings, as it has been impossible to develop a confident estimate of its SI revenues. The company does not collect or report SI revenues and is unwilling to provide an estimate, as there are pockets of information services throughout the organization. INPUT believes that TRW would most likely rank in or close to the top ten SI vendors.

In late November 1989, TRW announced that it would establish the TRW Systems Integration Group effective January 1, 1990, combining three existing organizations to focus on federal information systems and weapons systems integration. Hopefully, this new organizational structure will assist in counting SI revenues.

By industry classification, the top five overall vendors include two hardware firms, two professional services firms and one "Big Six" firm. All of them have established business strategies for growth through penetration of both vertical and cross-industry markets. Between them, they account for 45% of the market.

Four of the top ten SI vendors are hardware manufacturers, three are professional services firms, two are aerospace firms and one, Andersen Consulting, is a Big Six accounting firm.

Only three vendors—IBM, EDS and Unisys—have over \$100 million of revenues in both the CSI and FSI markets. Most vendors focus primarily on one of the two markets.

Exhibit III-23 displays the ranking of the commercial SI market vendors. Andersen Consulting leads with a market share of 16% and is followed closely by IBM with a share of 14%. Other vendors have not yet penetrated this market to the extent of having double-digit market shares.

Vendors with top ten commercial ranking, but without extensive federal market participation, include AMS, AGS/NYNEX, Andersen Consulting, Digital Equipment and McDonnell Douglas. Two vendors missing from the commercial top ten list, but ranked on the top ten FSI list (Exhibit III-24)—SAIC and Boeing Computer Services—are aggressively pursuing and penetrating the commercial SI business. CSC's commercial strategy that led to inclusion in the top ten CSI vendors included acquisition of highly skilled SI firms like Computer Partners, Index Systems and the Cleveland Consulting Group, and top-level executives from successful commercial integrators.

EXHIBIT III-23

U.S. Commercial Systems Integration Market Share, 1989

Vendor	Share (Percent)
Andersen Consulting	16
IBM	14
EDS	7
DEC	7
CDC	5
McDonnell Douglas	5
AMS	4
AGS-Nynex	3
Unisys	3
CSC	2

The top 10 vendors in the federal SI market are ranked by market share in Exhibit III-24. INPUT believes that the market shares shown are high, but the ranking accurately reflects relative market positions. The revenue used to develop this ranking is based on vendor reporting and INPUT estimates and does not adjust for possible double counting, discussed earlier in this section, or misallocation of other information services industry revenues to FSI.

Vendors with extensive government experience have learned to operate with smaller mark-ups or fees than are found in the commercial market. The leading firms have developed sophisticated program management methodologies and are accustomed to making frequent oral and written reports that are required by government procurement regulations.

These methodologies and practices provide disciplines that are welcome in the commercial market. However, they must be applied judiciously, as they are perceived as "overkill" practices by some commercial organizations. The challenge for the federal vendor is to convert these practices to a form that is readily acceptable to commercial clients.

EXHIBIT III-24

U.S. Federal Systems Integration Market Share, 1989

Vendor	Share (Percent)
IBM	17
EDS	12
CSC	10
Martin Marietta	10
SAIC	10
Unisys	9
BCS	7
Grumman	5
Black & Decker (PRC & ATI)	4
CDC	2

2. Vendor Market Coverage and Classification

One measure of market coverage is the number of vertical industry markets addressed by each vendor. The major vendors in the market are attempting to provide broad industry coverage, while smaller vendors specialize in a limited number of market niches. Analysis of INPUT's SI data base as well as responses to INPUT's competitive analysis survey of vendors are the sources of the market coverage data presented in Exhibit III-25.

The leader in vertical industry coverage is IBM, with SI projects in 13 of the 15 vertical industry sectors. This degree of penetration is a deliberate strategy of IBM, demonstrated by the formation of the Applications Solutions Line of Business in 1988. EDS/GM is identified with at least 10 vertical markets. Recent data does not reveal any additional penetrations, but EDS has recently reorganized along vertical lines, with internal coverage of virtually all vertical markets.

Andersen Consulting added another industry in 1989 to reach 9 vertical markets, in addition to several cross-industry markets. CSC increased its

EXHIBIT III-25

Leading Systems Integration Vendors Vertical Industry Penetration

Vendor	Number of Industries
IBM	13
EDS/GM	10
Andersen Consulting	9
CSC	7
SHL Systemhouse	6
AT&T	6
Unisys	5
BCS	5
DEC	5

number of vertical markets through acquisitions in the past two years in the U.S. and has also acquired a European SI firm.

SHL Systemhouse has projects for six industries, as does AT&T. The Systemhouse strategy is totally reliant on its methodology, which it believes it can apply to any vertical industry without previous industry experience. New data in the SI project data base indicates that both Unisys and BCS have expanded into two additional markets since last year's analysis.

It is also useful to segment vendors by the classification of their core business in order to understand their motivations, strategies, strengths and weaknesses. Core business class also provides clues which will assist in identifying potential teammates, as well as understanding competitors' bidding strategies. Exhibit III-26 provides this basic segmentation and gives examples of companies in each segment.

Most vendors focus their marketing on existing markets to protect and expand their existing market coverage. They look for partners, teammates or acquisitions in skill areas or markets where they lack market understanding or customer contacts.

EXHIBIT III-26

Systems Integration Vendor Examples by Class

Class	Examples
<ul style="list-style-type: none"> • Hardware Manufacturers • Communications Companies • Professional Services Companies <ul style="list-style-type: none"> - Consulting-based - IS Professional Services • Systems Operations • Aerospace Companies • Software Suppliers • Other 	<p>IBM, DEC, Unisys, NCR, CDC, Motorola RBOCs, AT&T, Contel, GTE</p> <p>Andersen Consulting, Deloitte Touche, Coopers & Lybrand, Price Waterhouse, Booz Allen Hamilton</p> <p>AMS, CSC, CTG, SAIC, SHL Systemhouse</p> <p>EDS, Systematics, Litton, SCI, STM</p> <p>BCS, McDonnell Douglas, Martin Marietta</p> <p>Oracle, Sterling Software</p> <p>Bechtel, Deere Technology, Covia</p>

Some vendors with extremely large customer bases, such as hardware or telecommunications vendors, recognize SI as a threat to account control. They seek partners or acquisitions to assist in protecting their existing business. Examples of some vendor class strategies to expand SI capabilities are identified in Exhibit III-27 and discussed below.

Equipment vendors have developed strong alliances, to augment dedicated in-house staffs, and to add software packages, professional services and systems operations skills. These moves allow them to offer a full range of support services. IBM, DEC and Unisys are involved in such alliances.

Software firms are moving toward in-house SI-oriented professional services. Oracle developed its Complex Systems organization to participate in the SI market and expand market coverage for its software products.

EXHIBIT III-27

Emerging Vendor Trends by Class

Vendor Class	Additional Capabilities	Strategic Target
Software	Professional Services (PS)	Applications Niches
Equipment	Software/PS Systems Operations	Full range
Communications	Software/PS	Network
Systems Operations	Professional Services	
Aerospace	None	Consolidation

Systems operations firms recognize SI as a vehicle for building systems for clients that they can later convert into long-term systems operations contracts. Most systems operations firms have added professional services skills to expand their ability to add SI to their core business.

Communications firms are adding both software and professional services to expand network services into full-scale SI projects. AT&T, Cincinnati Bell, Bell Atlantic, Nynex and Ameritech have made major investments in this strategy.

It is not clear how successful these actions will be in expanding market share. For some vendors, the addition of new capabilities and entry into new markets represents a real challenge to traditional cultures. Some vendors, for example aerospace companies, have already recognized that they are better served by leveraging their internal skills and products rather than attempting to provide a large number of services and products that are not synergistic with their core businesses. So, while many of these actions may fail, most vendors recognize that they must participate in SI to protect their core information services business and customer bases.

3. Secondary SI Vendors

The principal focus of most SI market discussions is the very large programs and the leading vendors. Many integrators also provide prod-

ucts and services to other integrators in alliances and partnerships and to in-house integrators. One part of the market not addressed in any depth is the role and revenue potential of vendors classified as secondary suppliers.

INPUT's Annual Information Industry Survey asks vendors about their interest and involvement in the SI market. Fifty-nine respondents said that revenues came from larger SI vendors and in-house integration projects. The results shown in Exhibit III-28 summarize their perceptions and INPUT's judgement of their limitations.

EXHIBIT III-28

Secondary SI Vendors

- Perceptions
 - High interest level in SI—a new market
 - Generally do not want to be prime contractor
 - SI a growing part of their business
 - Know who major players are
 - Want visibility to major players for specific capabilities
- Limitations
 - Experience base often limited
 - No large project management experience
 - Narrow technical skills
 - Lack of financial resources
 - If software or turnkey, restricted to own solution

Those vendors showing some level of SI market involvement have a high level of interest. Most, however, do not want to assume the risks of a prime contractor. They know who the major players are, what industries are being addressed and some of the key clients.

The secondary vendors uniformly admit to a need for visibility of their specific capabilities to major SI vendors and users. They want to find better ways of promoting and marketing their capabilities in a focused

manner. They would like to develop longer-term relationships, to become a regular part of key vendor teams.

The smaller secondary vendors have limitations that could work to a prime vendor's advantage, lessening the prospects of working with an eventual competitor. Most of the smaller vendors have a narrow range or few technical skills. They often lack financial resources to carry fixed-priced jobs on the books for any length of time. The experience base relates to their particular specialty. Their software or turnkey products usually apply to their area of specialization and not to a wide range of problems or applications.

Secondary vendors may lack large project management experience, but usually commit to completing contracted tasks within budget, and are motivated to be reliable as suppliers. Experiences which discourage secondary vendors include assignment of a disproportionate part of the project risk, and renegotiating the price of the task after the prime contract is signed.

Several of the major SI vendors have strong support vendor programs. These are aimed at maintaining good relationships through continuing communications—between projects as well as during them. The dialogue is two-way: suppliers and VARs receive training on new products/services and advice on future developments. In return, the major vendor hears about market changes, client problems, product difficulties and supplier concerns about support, parts and maintenance.

E

Technology Drivers

Implementation of information processing solutions becomes more attractive with each introduction of new technology. The range of potential business applications increases with each new development. New equipment and software developments anticipated for the 1990s offer opportunities for businesses to increase their competitiveness.

Exhibit III-29 lists the major technology drivers for the 1990s that will provide the processing power and flexibility desired by SI clients. Advances in program design and development, including CASE, will also play an important role in the development of information-based business solutions.

Relational data structures and management software permit rapid storage and retrieval of critical business information. These capabilities will allow organizations to better integrate their business activities, from order entry through manufacturing and product delivery. Open system standards will finally reduce the complexity of tying multiple vendors' products together. It will allow clients and information service providers to apply more of their resources to solving business rather than connectivity problems.

EXHIBIT III-29

**SI Technology Drivers
1990s**

- Relational data bases
- Open systems standards
- Advances in programming
- Multiplatform software
- Microcomputer power and capability
- Communications products

Multiplatform software is becoming an accepted commercial practice and a federal government objective. The heavy investment in hardware of most mid- to large-scale multifacility installations makes the acquisition and maintenance of platform-unique software expensive. Software that works on multiple hardware platforms, like IBM's SAA, has many advantages that will result in less costly implementation and much more flexibility for the user.

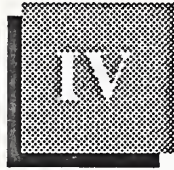
Increasing microcomputer sophistication, including the emergence of RISC machines and the new megabit chips, will provide more powerful workstations without seriously overloading existing mainframes. These microcomputers will support wider applications of artificial intelligence, automated machinery via CIM, and a wide variety of decision support systems.

Communications products are becoming increasingly rich with features. Providers of communication products recognize that integrated network (voice, data, image) solutions are necessary to support increasingly integrated systems and business processes.



Vertical Industry Markets for Systems Integration





Vertical Industry Markets for Systems Integration

As noted in the previous section, vendors may address systems integration opportunities within particular cross-industry segments, vertical industry markets, or both. This section will discuss the characteristics and key issues of each vertical industry, and the potential for systems integration projects.

In identifying and pursuing likely prospects, each SI vendor should be influenced by the following general characteristics:

- Sector susceptibility to systems integration contracting that results from the impact of a broad set of factors, such as internal and external market competition, regulations, capital investment funding availability, and the level of technical sophistication, including the prospect of in-house integration efforts
- Extent and growth potential for information resources integration, affected by the extent of automation, utilization of networks, moves toward centralization or decentralization of decision processes, relative age and variety of processing platforms and peripherals, and growth of end-user applications
- Trend towards user involvement in system design and operation that can seriously impact system acceptance, future utility and efficiency of the system. User involvement varies in practice between different vertical markets.
- Vertical market vendor expertise that is essential to counselling prospective SI customers in how the processes used in a vertical industry can be addressed with a technology-based system solution
- Sophistication and density of competition should be carefully investigated and evaluated to avoid competing with companies that have better-than-even chances of winning. Bidding projects with uncontrol-

lable risks, or bidding without the advantage of key alliances essential to the desired solution should be avoided if the capabilities are not currently resident in the bidder's organization.

A

Banking and Finance Services Industry

This sector covers four major areas: commercial banks, thrifts, security and commodity brokerages, and other financial services. The latter encompasses credit unions, mortgage banks, cooperatives, and personal and industrial financial institutions. Insurance is discussed as a separate vertical sector.

1. Industry Forces

Major changes in the current financial environment created trends that affect the industry's image and methods of doing business. These changes include: deregulation, the thrift crisis, and financial/demographic factors.

Bank earnings in 1989 were lower than projected, yet commercial banks and credit unions improved. Of the money centers, only Bank of America and Citicorp had positive improvement, as did diversified financial services. Real estate investments dropped drastically, and growth in the regional banks was uneven across the nation. Overall, the industry grew by less than 5%—below market expectations.

The principal industry reactions include extension of functions into multiple business lines, acquisitions and mergers, and new offerings of individual products and services. The industry goal is full relationship-based banking, with brokerage services, investment advice, money markets and other nontraditional services all available to the customer. All of these directly affect the structure and function of information processing.

2. Impact on Information Systems and Services

The consolidation of financial institutions, extension and increased availability of products and services, and globalization of the industry have pushed information systems and services into a key role. More data and information must move rapidly downstream to the customer and upstream to institutional management and banking regulators.

Regulatory changes and the increasing range of services put enormous stress on in-house IS staff. Highly specialized experience is needed for short periods, which may not be available in small institutions. The average life cycle of current systems is becoming shorter, so that more frequent upgrade or replacement is essential.

Financial managers need more information and supporting analyses to make the decisions that will keep their firms competitive. Portfolio and credit services require customer services and account managers to interact with most of the previously independent departments of financial institutions.

Distributed data processing will need integration with central data processing applications, employing standardized network protocols and systems architecture. New systems must provide PC user interfaces for access to central computer facilities to allow combining of office tasks, financial processing and service analyses by a single manager.

Expansion of access to a widening range of internal data by users and customers increases the demand for data management. Control, integrity and security of frequently sensitive data are major concerns of banking and financial management.

3. CSI Potential

The potential for systems integration in banking/financial institutions appears to be lower than predicted earlier. Though still in the top three vertical industries in prospective out-year expenditures and growth rates, it has been surpassed by state and local government in funding and retail distribution in growth rates. This was shown in Exhibit III-13 earlier. The positive and negative external pressures on information systems and services are listed in Exhibit IV-1.

Systems closest to the primary business (direct deposit and loan in banks, for example) will continue as the most active area of development. In addition, trust, centralized customer information, correspondent banking services, check processing, and commercial loan systems will need to be integrated with the traditional services.

Office automation and banking/finance applications may merge on a banking officer's desktop in the familiar PC, with above-average demand for applications software, communications hardware, and integrated services. Demand continues for completing communications hardware purchases and integrating telecommunications networks of individually developed applications systems.

Communications technology with lower error rates is particularly important as financial companies extend their electronic transactions across the country and around the world. National networks of ATMs and debit cards are a competitive necessity. Other financial services that require extensive networking are expected to follow.

Applications software packages continue to be in demand in this industry. Many software vendors have targeted banking/finance as a growth indus-

EXHIBIT IV-1

Key Factors in Banking/Finance Industry

- Positive
 - Shift to merchant banking
 - Building integrated systems
 - Increased new product/service introduction
 - Electronic transaction growth
 - 24-hour financial market activity
- Negative
 - Savings and loan retrenchment
 - Brokerage consolidations, layoffs
 - Industry and application experience required
 - Platform-based system preference
 - Network cost limits

try for integrated applications. The availability of alternative products makes many firms believe that off-the-shelf solutions are the approach of choice for applications. Custom development will continue to be required for addressing the entire integrated solution.

Several factors can negatively affect the direction and speed of CSI development in this marketplace.

Retrenchment of the savings and loan industry appears to be consolidating support services in fewer organizations. The brokerage house reductions, layoffs and consolidations will have the same effect. The new owners/survivors frequently have sophisticated systems in place. Like the majority of CSI prospects in other sectors, the in-house staffs will be the main competition, with a strong desire to "go it alone" in planning, managing, and executing large projects.

The banking/finance industry requires highly sophisticated, industry-specific knowledge for successful systems development. Vendors must be able to integrate advanced technology into industry-specific applications knowledge. Vendors targeting the largest banking/financial serv-

ices institutions also must be in a position to demonstrate internal capabilities.

The management of security is a critical issue in this industry. Validation/authentication of messages in transaction networks and prevention of network infiltration and tampering are now an important aspect of systems development. The security issue also means opportunities for disaster recovery technologies, secure networks, and signature verification systems.

There is a strong preference for continuing the use of incumbent hardware and software, especially when the vendor provides strong customer service. Though the industry may consider risks daily, management wants reliability in the information process. New equipment and procedures represent a threat to the back-room dependability. The same is true of network services; reliability is absolutely essential, but not so absolute as to be an excessive financial burden. Limits are set by the financial managers.

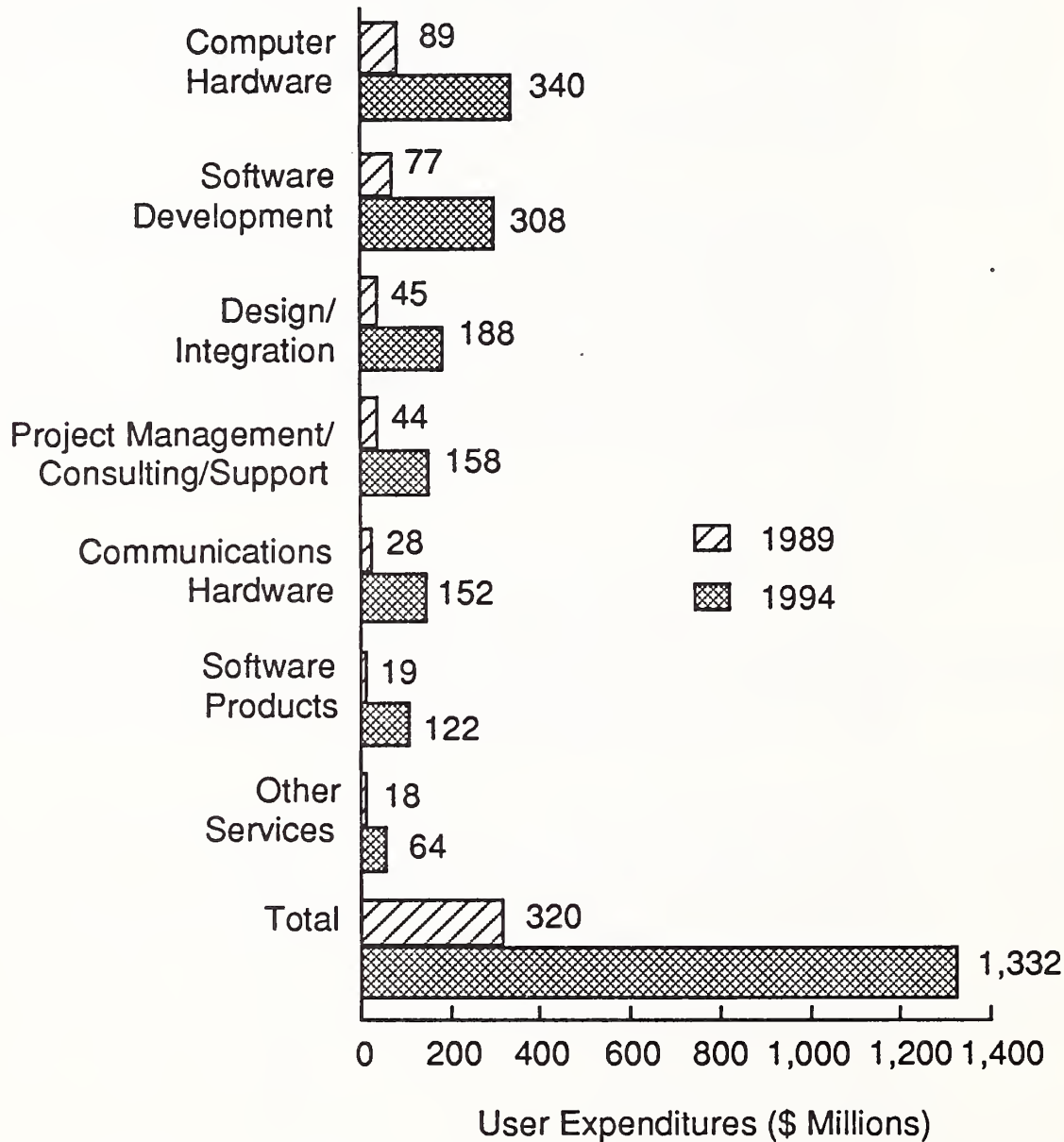
4. CSI Forecast

Exhibit IV-2 summarizes the main components of the industry's CSI market for 1989 to 1994. Computer systems will continue to be the single largest component of CSI expenditures, as companies move to meet new service and product requirements. Systems outlays will be followed closely by software development.

Design/integration and project management/consulting together account for as much expenditure as software development, growing to \$308 million by 1994. Designs will be driven by the need for nonstop architecture, satisfaction of complex real-time transaction processing volumes, and rising security demands at terminal entry points. The wide range of available banking-oriented software packages will drive down the price of individual packages, offsetting increased usage. During the five-year period, the banking/finance CSI market is expected to grow to \$1.3 billion in annual expenditures, less than forecasted in previous years.

Over 450 information product and service vendors are identified with this market. But only a few appear as serious system integrators. IBM has been the principal platform supplier to this industry and is now engaged in a number of SI projects with specific institutions. Other hardware vendors include NCR and Plexus Computer. Andersen Consulting and Coopers & Lybrand lead the Big Six, all of whom are moving toward CSI opportunities in this market. CSC, EDS and Systematics have become more active in the past few years, joined by management firms like American Management Systems and Booz Allen Hamilton. AT&T and Telenet have been identified with several projects in network integration, and McDonnell Douglas is also working on SI projects.

EXHIBIT IV-2

Banking/Finance Industry Forecast, 1989-1994**B****Discrete Manufacturing Industry**

This sector covers a wide variety of fabrication or assembly-type manufacturing activities, and care must be taken not to view the sector forecasts as referring to a homogeneous market. Discrete manufacturing is the largest sector of the commercial marketplace, but it is also the most disparate collection of narrowly focused vertical markets, each with its own specific characteristics. Analysts combine specific products into major industry groups, such as: aerospace, automotive, metal fabrication,

electrical, electronic, telecommunications, textiles, industrial machinery and tools industries, to simplify discussions of trends. This sector excludes consideration of unique automation devices such as robotics and other non-information machinery.

1. Industry Forces

Foreign competitors' successes in penetrating the U.S. domestic markets have discouraged growth in this sector and in several areas resulted in loss of market share. However, there have also been significant productivity gains. In heavy equipment, the net change was an increase of 10%, cosmetics 31%, and electronic components 4%. Overall industry growth in 1989 was around 10%.

Some industry reorganization has occurred, but the primary changes have been advances in manufacturing technologies and the widespread adoption of automation. Manufacturers are implementing flexible manufacturing systems (FMS) to improve the ROI of capital machinery, and providing rapid reconfiguration to meet changing fabrication/assembly demands. Manufacturing planning and control systems (MPCS) and material resource planning (MRPII) are being employed, along with practices like "just-in-time" to reduce the costs of carrying inventory. Automation of the shop floor and the efficient utilization of inventory and capacity are viewed as the main productivity goals of the industry.

Application of artificial intelligence, development of expert systems and continued emphasis on computer-integrated manufacturing (CIM) are additional thrusts for productivity through technology that are largely in the proposal stage and not yet widely implemented.

INPUT believes that the application of these technologies can contribute to cost control. Real advances in productivity will come, however, only by revising the entire manufacturing process, rather than by piecemeal automation that produces islands of automation with relatively small improvements. Production experts have postulated the urgency of the need to implement existing technologies, as well as those now in development, for the survival of the majority of discrete manufacturers in the 1990s.

2. Impact on Information Systems and Services

The IS environment in discrete manufacturing seems stable, perhaps even mature. Decreasing hardware costs, better price/performance ratios, and emphasis on purchasing rather than leasing equipment have all served to create a very large base of installed systems, including both hardware and software.

The push to automate manufacturing processes has also created a very large base of mostly incompatible and unconnected process control and automation equipment, ranging from materials handling, CAD/CAE, and process controllers to assembly robots and automated guidance vehicles for parts retrieval from stores.

In many of the discrete manufacturing firms, the IS and production organizations function independently of each other, seldom sharing the same data processing platforms. Information systems that process the financial, sales and administrative aspects usually come under the control of the IS organization. CAD/CAE/CAM/CIM systems tend to be the responsibility of the production/operation departments, often not involving the IS department. However, the newer MRPII and MPCS technologies merge the separate functions, requiring interaction and agreement between the two groups.

The new systems that integrate the sales, purchasing, invoicing, production, and inventory control functions will push IS into interactive, on-line, and real-time or near real-time modes of operation. A substantial number of current financial and administrative systems in this industry do not and have not needed to operate in real time, and are not equipped with hardware and software to support the needs of flexible manufacturing systems (FMSs).

3. CSI Potential

This industry has been at the forefront of CSI expenditures for some time, principally from the attention given to computer-integrated manufacturing (CIM) and manufacturing resource planning (MRP). The need to improve competitive position and availability of automated systems to improve efficiency encourages firms to adopt CSI, as noted in Exhibit IV-3.

A key factor driving the growth of information systems in this industry is the need to integrate factory floor automation with resource planning, sales and management. Use of JIT (just-in-time) procedures requires accurate measure of both demand and production rates.

Rapid reference to buying patterns, material supply schedules, and production capacity is increasing the use of on-line data bases. This is a new method for many firms that have used human judgement in the past. The information industry lacks a comprehensive background in this area. At the same time, the uniqueness of submarkets, manufacturing processes and scheduling creates a preference for customized solutions that could provide a competitive edge.

EXHIBIT IV-3

Key Factors in Discrete Manufacturing Industry

- Positive
 - Integration of islands of automation
 - Increased use of data bases
 - Preference for customized solutions
 - Replacement of batch-oriented systems
 - Network distributed PCs/workstations
- Negative
 - IBM dominates hardware component
 - Tendency to build rather than buy
 - Slowdown in MAP/TOP implementations
 - Industry and CSI experience prerequisite

The current inventory of batch-oriented systems must be replaced to meet the needs of integrating sales-to-customer factory procedures. Some of the newer hardware may be convertible, or of some historical data use, but the major share needs to be replaced. Increasing use of PCs and workstations for sales, design, scheduling and supply/resource control will expedite the conversion, while emphasizing use of distributed networks in a difficult environment.

The size of this sector and the expected large expenditures are attractive to SI vendors. Projects tend to be large (e.g., \$20 million), multiyear efforts that fit well with the stable DP environment. Many dollars are also available for smaller, shorter projects, and the use of outside services is growing faster than inside services in this sector. Since client familiarity and acceptance of contractors are essential for CSI, these propensities are also attractive characteristics.

The variety of project types is also widespread, from the factory floor to the sales office, indicating a gradual development of traditional areas. Application targets emphasize industry-specialized manufacturing systems, including production/process automation, manufacturing informa-

tion systems (inventory control, scheduling, material requirements planning, and manufacturing resource planning), CIM, and "factory of the future" developments.

As in other markets, IBM's hardware dominance and strategy are factors. IBM has short-term products in place (CAD/CAE, industrial robots, shop floor microcomputers, etc.) and an apparent long-term strategy of tying these components together in an architecture based on a DBMS on the mainframe. Vendors should be sensitive to the presence of IBM in determining a suitable competitive strategy.

Although IS managers frequently cite the absence of project management skills in their staffs, operations executives note the increasing use of systems specialists for CAD/CAE/CAM and automation projects built in-house as workload and financial conditions permit. The tendency of the larger organizations is to build the integrated systems rather than buy them from a CSI vendor. Medium-sized and small companies are usually less inclined to carry the needed specialists in their constrained overhead accounts.

Many IS managers in discrete manufacturing report use of CSI contractors and many have negative feedback. They fear the loss of control that seems to be inherent in CSI and show concern for the vendor's lack of industry and CSI experience. Vendors may need to initiate early and sustained sales efforts to win the major projects, and demonstrate, through alliances if needed, the prerequisite industry knowledge.

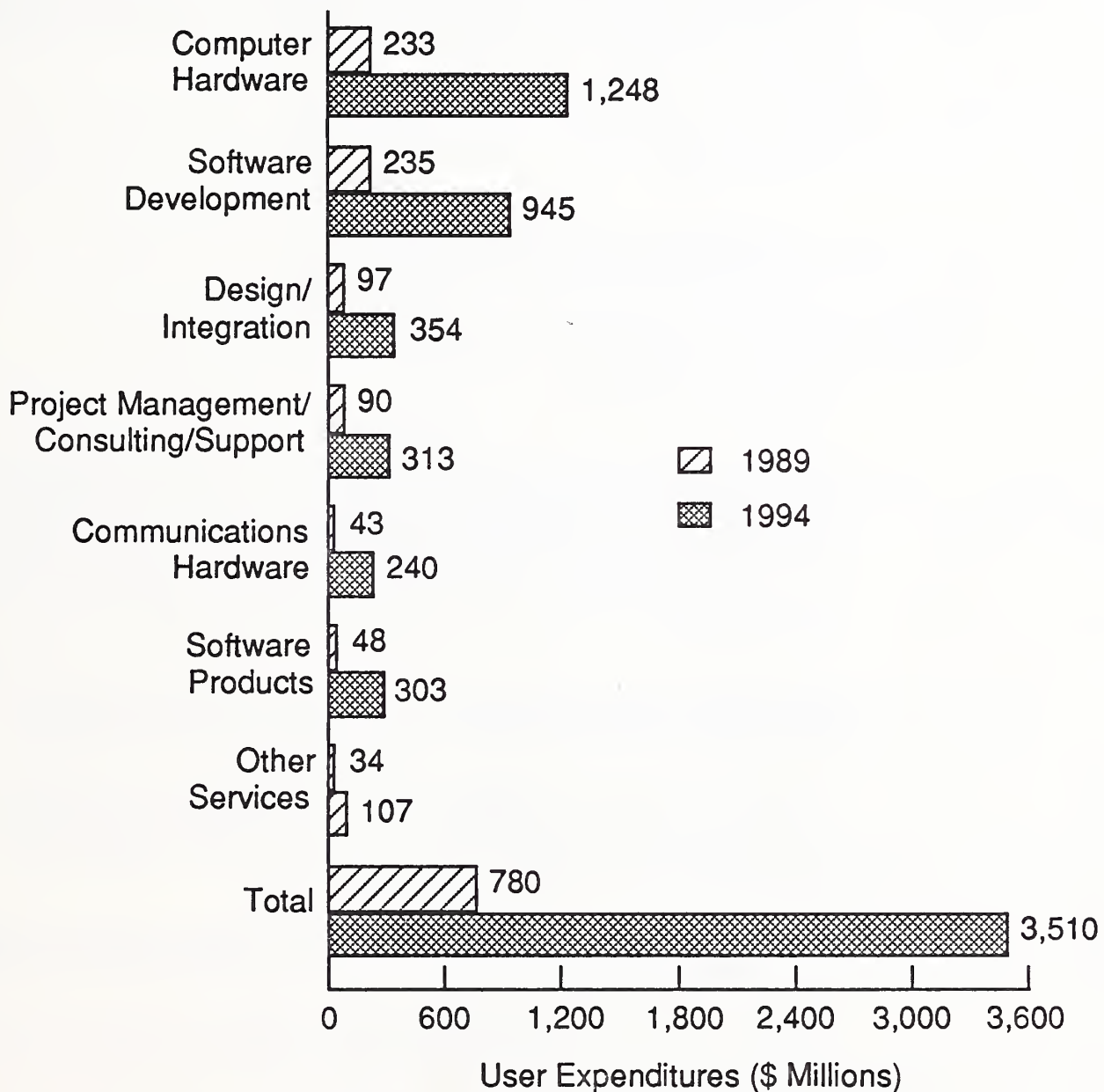
4. CSI Forecast

The forecast for this sector in Exhibit IV-4 shows a market about one-and-a-half times as large as the next largest sector, experiencing a CAGR of 35%, an increase of 3% over the 1988 forecasted growth rate. During the past two years, there has been increasing emphasis on new hardware, which is now expected to grow to \$1.2 billion by 1994. Software development is the second largest requirement, reaching \$945 million by 1994.

The need to interconnect the islands of automation with sales, suppliers and planning will increase expenditures for networks. Some parts of these must operate in demanding factory floor environments.

The different requirements of the market are being addressed by several groups of CSI vendors. The competition in hardware vendors includes IBM, DEC, Honeywell-Bull, and Litton. AT&T is currently the leader in networks, while Harnischfeger, Brock Control, Siecor and Keane Associates are leading industry specialists. In addition to Andersen Consulting, other leading systems vendors include BCS, CSC, IBM, SHL Systemhouse, CACI, Systems Unlimited and CTG (SSS). A number of

EXHIBIT IV-4

Discrete Manufacturing Industry Forecast, 1989-1994

spinoffs, like John Deere & Company's Technical Services Group, are expected to play a role where industry expertise is the most important CSI selection criterion.

This market is so diverse that even with formidable competition, it remains the single largest pool of opportunities for most systems integrators.

C**Education**

Education is subdivided into academic and industry/commercial segments. The academic segment includes both public and private institutions that provide basic education from kindergarten through 12th grade, vocational schooling, community colleges, and institutions of higher learning for undergraduate and graduate study. Vocational schooling is available at 10th to 12th grade and post-high school business, trade, and technical facilities.

The four major areas of opportunity for information-based solutions in education are:

- Administrative applications
- Academic/courseware applications
- Research
- Library applications

1. Industry Forces

Education continues to receive a great deal of attention as reports comparing test results of U.S. students and those of other countries place the U.S. behind. The new president has placed emphasis on this area and is receiving strong support from industry. This should result in increased focus and spending for systems that will result in improved academic achievement.

There are, however, a number of factors that constrain the use of information services within the educational market. They include:

- Flattening enrollment patterns that result from decreasing family size, although there continues to be an emphasis on post-high school education
- Constrained funding sources that result from state and local funding and spending limits
- Reduced federal spending on educational software and for research grants

2. Impact on Information Systems and Services

Larger educational institutions employ IS staffs to operate academic and business centers. The academic support includes timesharing mainframes and interconnected microcomputers for computer studies, research, and courseware. Administrative functions include class and teacher scheduling, student records, building and equipment maintenance, and the usual range of payroll, finance, and accounting functions. Library functions may be controlled by either of the staffs discussed above or separately.

The increased focus on improving the quality of education should begin to loosen spending in areas that will have the most impact on academic results. This loosening should include spending for more microcomputers and courseware in the K-12 arena and networking of capabilities within and among campuses.

Industry also appears willing to spend in areas that will better prepare students in technical areas in which it believes the U.S. is trailing, but industry requires to be competitive. Expenditures for systems to improve computer science skills and to perform research in the advanced applications areas such as artificial intelligence, groupware, and CIM should be anticipated.

Large private colleges and state university systems will be competing for public and private grants to perform research for the government and industrial companies. This competition will encourage institutions to develop and maintain state-of-the-art research facilities.

3. CSI Potential

Education is one of the smallest markets for systems integration, yet it includes some relatively large opportunity areas. Factors driving these areas and hindering others are included in Exhibit IV-5.

EXHIBIT IV-5

Key Factors in Education Industry

- Positive
 - Increased demand for campuswide services
 - Network requirements/distributed computing
 - Industry-sponsored research
- Negative
 - Constrained state and local funding
 - Cuts in federal aid programs
 - Political marketing environment

Most colleges and universities have incorporated microcomputers as important elements in their curricula. On some campuses students are required to have a PC and on others a PC must be readily accessible. There is a need to have inter- and intracampus networks tying together student terminals and a variety of computer resources. Only a few institutions, fewer than 200 out of 2200, have stepped up to this requirement and provided campuswide networks. Less than 20 state-level college and university systems have completed statewide intercampus networks.

In support of the presidential emphasis on education and in support of its own concerns about competitiveness, industry has increased grants to education. These research grants require immense amounts of computer processing capability, again available on a campuswide and statewide basis. These grants drive the demand for systems integration skills to build supercomputer complexes and network them throughout the research community.

On the negative side, the educational SI market continues to be constrained by real budget limitations and market factions that want to eliminate any increases in taxes. There have been, and most likely will continue to be, reductions in federal research grants. The political environment in education takes a special type of marketing by sales people who know and understand this unique market.

4. CSI Forecast

The forecast for CSI expenditure is illustrated in Exhibit IV-6. The market was \$72 million in 1989 and is forecasted to grow to \$175 million in 1994, at a compound annual growth rate of 19% over the forecast period. Hardware spending, now virtually the same as professional services, will grow faster than professional services and be 30% larger by 1994.

The major integration vendors in the education industry market include IBM, CSC, Coopers and Lybrand, Systems and Computer Technology, AT&T, Boeing Computer Services, and University Computer Systems.

D

Insurance Industry

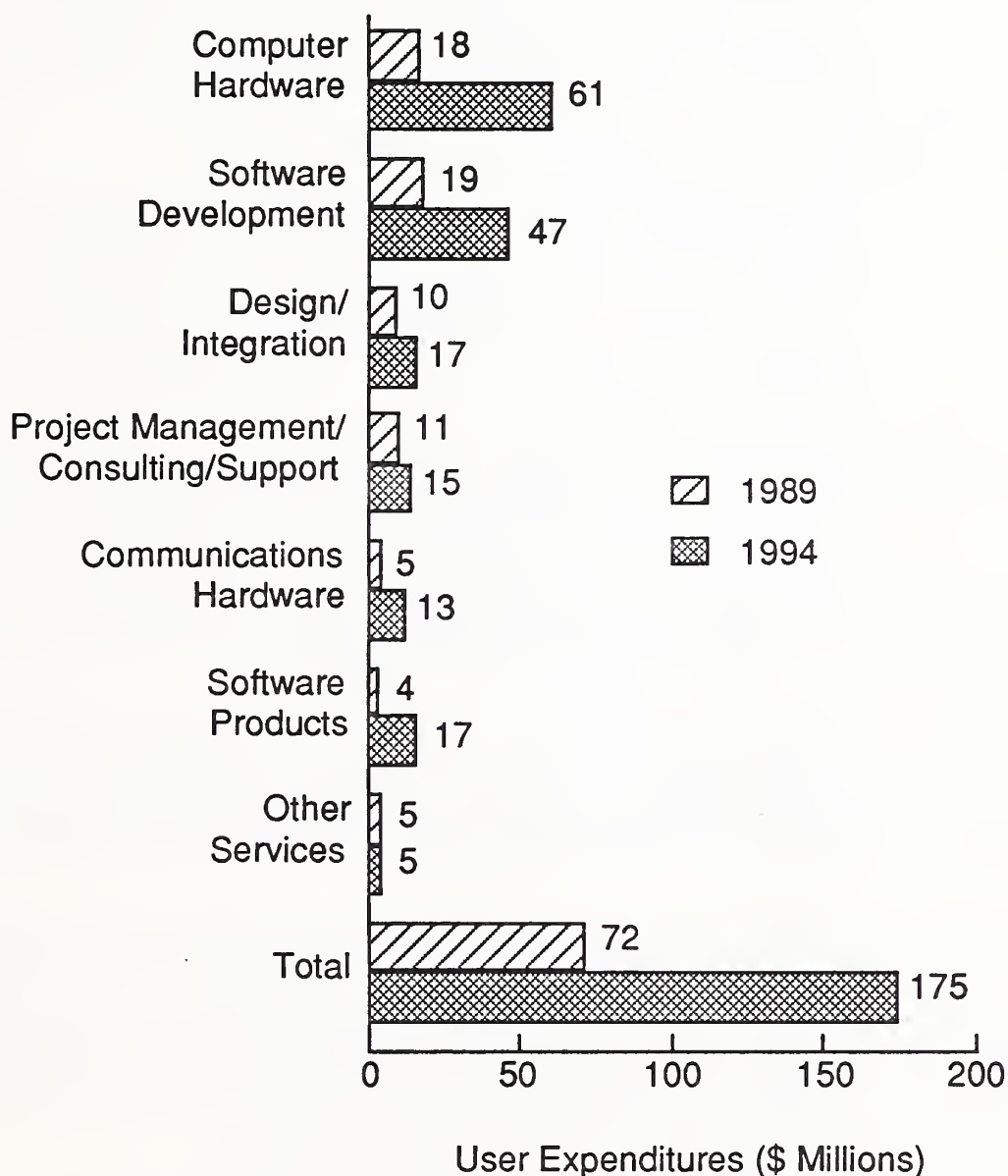
This sector is composed of life, property, casualty, and health insurance; the reinsurance segment of agents and brokers; and medical claims processing.

1. Industry Forces

Insurance providers who operate in a highly competitive environment are now facing further dilution of market shares by the potential entry of banks, hospitals, and foreign competitors. Financial institutions have made their appearance in the insurance market as competitors by offering

EXHIBIT IV-6

Education Forecast, 1989-1994



“benefit consultants,” “financial planners,” and “full-service” business planners.

Other problems face the industry in the form of increased liabilities from tort actions, a growing elderly population with increasing policy levels, the AIDS epidemic, and consumers’ concerns about insurance availability and affordability. At the same time, severe losses in the insurance industry in 1989 due to storms and earthquakes and deregulation of the banking/financial industry forces the same kinds of restructuring of this industry as in banking/finance.

Overall, however, the industry has shown improvement over 1988. Life insurance recovered, along with group health and retirement plans. More automation is required now in each agency and more connectivity needed between each agency and the home office. The competitive environment led to new insurance products with more complex premium calculations, and to diversification into financial areas and interest-sensitive products with fluctuating interest rates that need constant monitoring.

2. Impact on Information Systems and Services

A tight economy and increased competition is causing the insurance business to reduce costs by improving efficiency. Improvement of operations and increased productivity will most likely be accomplished with a stable or reduced workforce, increased capabilities of existing systems, and the automation of additional functions.

A new role of IS is the effective management of change, the anticipation of systems needs for new product lines, and the provision of immediate IS support. System flexibility is essential to accommodate more products, improve customer services and sales, and permit nationwide system consolidation across all lines of business. Intra- and intercompany businesses will require a level of compatibility among systems on the same order as the banking/financial industry.

Insurance companies need more timely information, especially in claims administration, to write better and more-competitive policies. Access to mainframe data through enhanced communications capabilities will improve user efficiency to offset some of the staff reductions.

There are requirements for building an infrastructure to support agents in the field, by giving them a sales support system and by networking within and between offices. Artificial intelligence and expert systems are expected to play an increasingly important role in applications such as underwriting, risk management, investment planning, policy customization, and medical review analysis.

3. CSI Potential

The health and life insurance sectors of this industry are experiencing growth that is generating new and improved systems to support them, as shown in Exhibit IV-7.

Much like the banking/finance industry, insurance reacts to competitive pressure and needs to manage not only insurance products but also financial products. Recent industry changes lead insurance companies into the same arena occupied by banks and other financial institutions, and causes insurance companies to offer new products that require additional support.

EXHIBIT IV-7

Key Factors in Insurance Industry

- Positive
 - Growth in health/life insurance
 - New products (insurance and financial) support
 - Need for on-line policyholder/client information
 - Development of new systems
- Negative
 - Cost controls limit new starts
 - Declining property/casualty strength
 - Industry-specific knowledge/experience
 - Self-sufficiency mentality

CSI projects focus on integrating systems among product lines (insurance and financial, for example) and between the parent organization and the vast structure of the sales organizations (through integrated networks).

Corporate data bases might include subsystems for sales/marketing (product management, client file, agency support systems, new insurance/claims, applications, etc.), for management (accounting, accounts payable, insurance, administration, office applications control system), and for policy management (loss system, rating/policy issuance, casualty rating, etc.). Image processing has become an important new application area in this vertical market. Insurance companies are capturing complete client files on optical disk or microfilm that is available almost instantaneously to answer client service inquiries.

The opportunity for CSI vendors appears to be more in the development of new systems, rather than upgrades and expansions of current ones. These new systems are important to the business, but IS is frequently unable to develop them. Most personnel are assigned to maintenance, resulting in a shortage of capabilities in the more sophisticated technologies acquired in integrated systems. IS managers in this industry note the importance of project management skills in design and implementation of networked systems, and the frequent lack of these skills within the in-house staff.

The most significant constraint of CSI growth is the limit placed on new system starts by the cost controls of a highly competitive industry. Projects might be performed in phases to minimize investment risks. Weakness in the property and casualty business will limit new IS systems development even more in these sectors.

As in every vertical market, there is a strong preference for demonstrated industry-specific knowledge. This requirement tends to favor spin-offs from insurance IS organizations and CSI vendors with extensive insurance and financial systems experience. This sector has had a number of CSI projects in the past that ran into major problems. Competition has involved financial and schedule overruns, and a resurgence of the industry's self-sufficiency mentality, including the spin-offs, has resulted.

The earlier expectation of above-average growth did not materialize since the 1986 forecast, when the insurance industry was identified as having the potential for the fourth fastest growth rate. Insurance is now tied with the medical industry for sixth in terms of growth and the potential for expenditures by 1994.

4. CSI Forecast

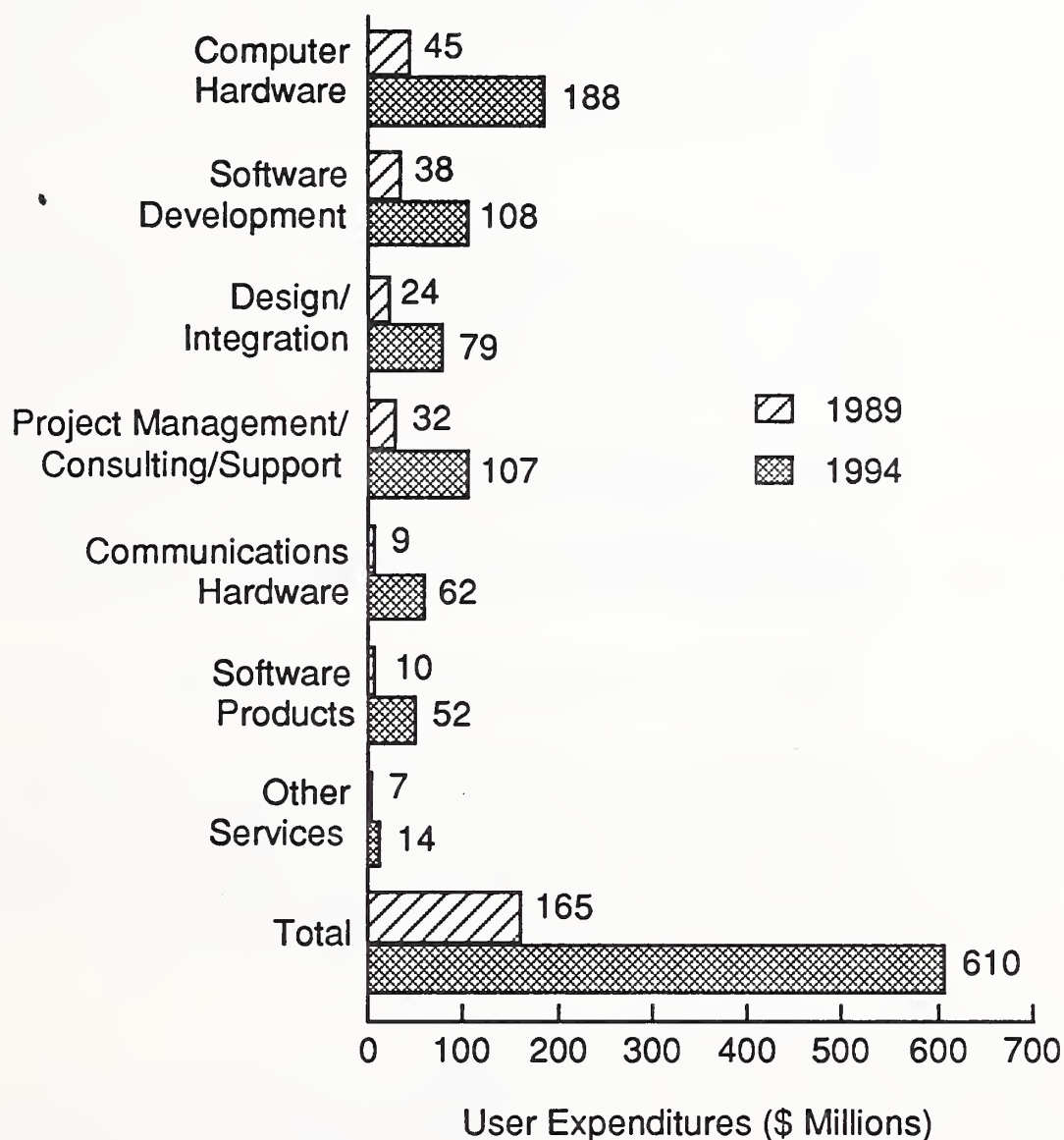
The forecast for this sector noted in Exhibit IV-8 shows a 30% CAGR from a base of \$165 million in annual expenditures in 1989 to \$610 million in 1994. This growth figure represents a slight increase over the 1988 forecast, and placed insurance among the few industries to show an improvement in this past year.

The largest individual component by 1994 will be hardware, at \$188 million. The customized nature of the requirements is reflected in the low forecast for standard software products and by high software development expenditures that will grow to \$108 million in 1994. The combined professional services will be the largest sector expenditure, increasing from \$94 million this year to \$294 million in 1994.

There are only a few CSI vendors with experience in this sector. EDS, IBM, and CSC have extensive claims processing and policy systems experience. Andersen Consulting and Coopers & Lybrand have implemented systems, and Equifax has provided both services and systems in specialized areas. The predominant platform is provided by IBM, which is also providing complete systems as part of its new strategy. Plexus Computers is a recent vendor in current SI projects, as is The Continuum. Penetration of this sector by CSI vendors is viewed as difficult without industry experience or an alliance with one of the above vendors.

EXHIBIT IV-8

Insurance Industry Forecast, 1989-1994



E

Medical Industry

This sector includes physicians, dentists, hospitals, medical and dental laboratories, nursing homes, outpatient care facilities, and allied services. It excludes health insurance and medical claims processing covered in the insurance industry sector.

1. Industry Forces

Health care providers lost more than 10% in 1989, offset in part by increased revenues from special services and general hospital care. Competition is already a factor with the emergence of health maintenance organizations (HMOs), preferred provider organizations (PPOs), and investor-owned hospitals and group practices. Hospital care is the dominant category of costs even in an environment where occupancy rates continue to fall. To contain costs, the length of hospital stays has been shortened by shifting to outpatient care and home health agencies (HHA).

The federal government, Blue Cross/Blue Shield and other insurance companies, and even large employers are pressuring health care providers (physicians/dentists, hospitals, laboratories, nursing homes, outpatient care facilities) to reduce costs, which are rising faster than the consumer price index (CPI).

The government has established prospective payment systems (PPSs) in diagnostic-related groups (DRGs) and shifted reimbursements from a cost basis to a DRG basis. Providers forced to compete for a declining number of patients and medical reimbursement are seeking solutions with lower costs.

2. Impact on Information Systems and Services

DRG-based reimbursements demand current, on-line handling of patient information on a cost rather than expenditure basis. Separate systems for financial operations, patient care, nursing management, and laboratory management are being integrated. Integration will reduce data entry redundancy, error rates that accompany constant re-entry of the same information, and the wasted time that occurs with both.

3. CSI Potential

Constraints in federal support health care, particularly Medicaid, will continue, and the efficiency in such diverse areas as reimbursement systems, medical records, patient history, pharmacology, and bed occupancy will fuel CSI activity, as seen in Exhibit IV-9.

Defensive medicine is being practiced by physicians and hospitals to reduce the risks of unfavorable malpractice judgements. Defensive medicine includes duplicate tests, extensive diagnostic procedures, use of consultants, and extensive documentation creation and retention. The information systems associated with these activities require integration of the current standalone information and data processing systems.

EXHIBIT IV-9

Key Factors in Medical Industry

- Positive
 - Pressure to constrain medical services costs
 - Defensive medicine requirement for more data
 - Growth in departmental systems
 - Increasing outpatient services
- Negative
 - Turnkey systems vendors very active
 - Industry experience and acceptance required
 - Limited number of large clients
 - Bottom-line financial limitations
 - Crowded marketplace

Intrahospital communications networks will be important as some networks extend to other community providers such as physicians and laboratories. Equally important will be large data bases that consolidate patient information and insurance claims tracking. Major projects will involve integrating applications within the same physical location and larger departmental systems.

The pressure on facilities and rising costs of in-hospital care is moving many procedures to outpatient services. Most institutions have extended their physical plants to support the move, which is parallel to the growth of HMOs. Information support systems must be improved or developed to provide government-required records, and this growth will be reflected in a number of integration projects.

The turnkey systems vendors have done well in this market and will likely continue to succeed. This is not a market where entry is particularly easy, but local VARs have been effective in gaining acceptance from administrative and medical staffs. The result is a reduction in demand for medium-scale systems integration projects.

The size of the medical CSI industry is constrained by the limited number of establishments large enough to support the size of effort typical of

systems integration projects. In INPUT's forecast, fewer than 300 companies are sufficiently large enough, including major hospitals with over 300 beds, multiple-service clinics, and multisite HMOs and PPOs. Of those, only 25% to 30% are expected to undertake major CSI projects, either internally or externally.

Medical institutions that have begun or recently completed CSI projects highlighted their requirement that the proposed solution had to demonstrate a bottom-line contribution and a cost envelope that met the institution's outlay expectations. CSI vendors will need to overcome the financial limitations with creative project financing and by building a strong case for the cost savings that will result from planned projects.

4. CSI Forecast

The forecast for this sector shows in Exhibit IV-10 the lower potential for CSI that INPUT now expects—an annual expenditure of \$610 million by 1994 and a CAGR of 24% from a base of \$210 million in 1989. The emphasis will continue to be placed on newer computer hardware, with custom software development following closely behind. Communications prospects appear to be higher now, as new network requirements are identified.

More than 160 vendors sell information products and services to the medical sector. Leaders in hospital MIS include HBO, SMS, CSC, SAIC, and Ernst & Whinney. Leaders in patient care are IBM, EDS, SMS, McDonnell-Douglas Health Systems, and CyCare. There are also a relatively small number of software companies that have successfully developed packages adapted to the medical environment. Alliances with these vendors could be beneficial to potential CSI contractors. The current SI vendors include IBM, SMS, Health Data Sciences, KDSI, Lab Force, and Sytek.

F

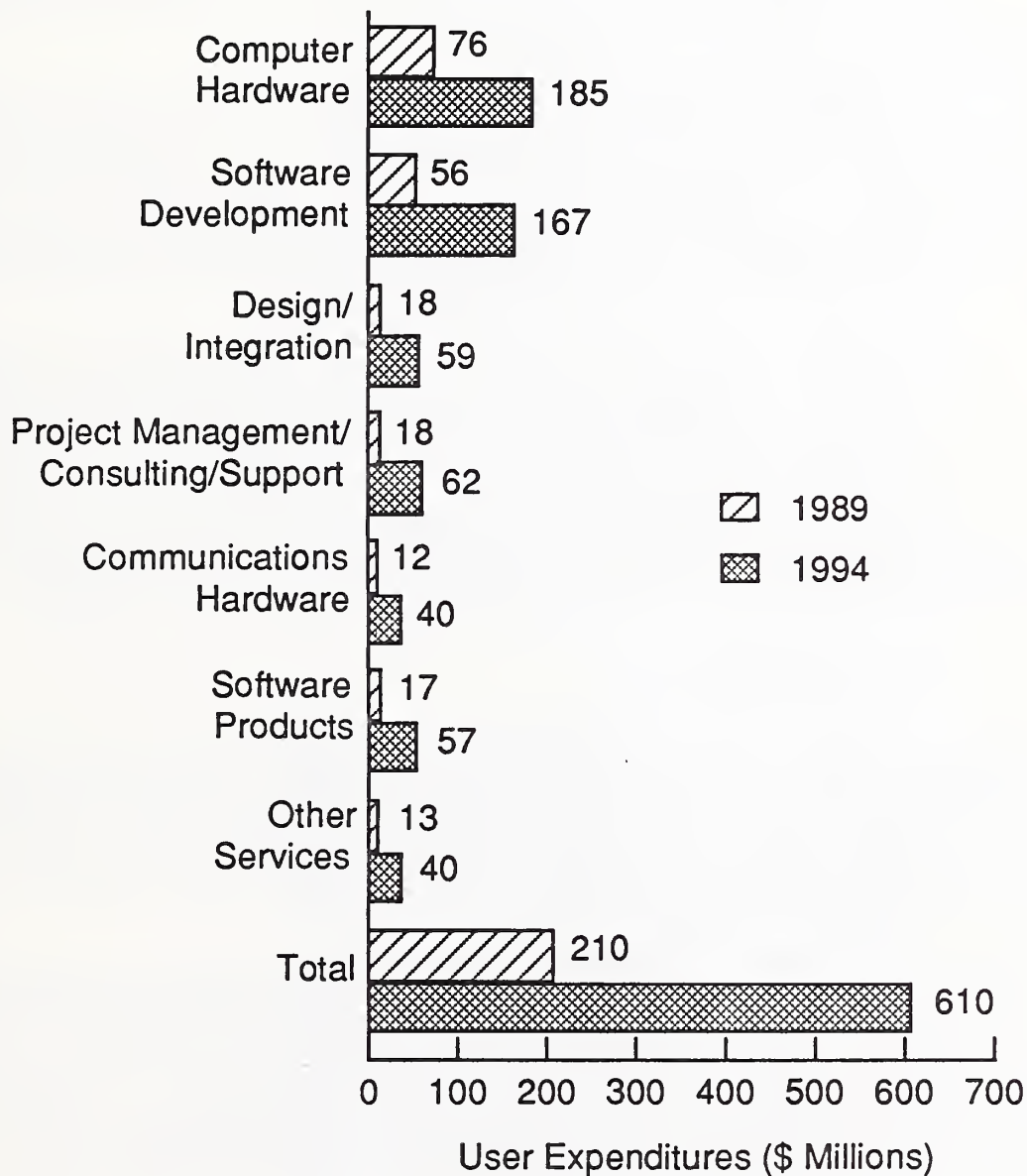
Process Manufacturing Industry

This sector is a combination of medium and large corporations active in oil and gas, mining, tobacco, chemicals, paper and wood products, food processing, rubber, primary metals, and plastics.

1. Industry Forces

This vertical market did not fare well in 1989. Metals—except for nonferrous, coal, and oil—declined markedly. Pharmaceuticals were erratic, as FDA changed official positions on the acceptability of several well-known products. Chemicals, forest products, and paper grew at rates ranging from 9% to 14%. The overall market decreased about 15%, with associated decrease in IS expenditures.

EXHIBIT IV-10

Medical Industry Forecast, 1989-1994

The process manufacturing sector is driven in recent years more by the economy and off-shore competition than by manufacturing technologies. Major efforts are focused on reducing costs, improving operating efficiencies, increasing capacity utilization, and reducing capital commitment risks, while maintaining a competitive posture through automation. The solution to the cost problems of some organizations was mergers to gain economies of scale.

2. Impact on Information Systems and Services

Financial, technical, and personnel factors forced moderation of growth in IS. Automation of manufacturing processes, as in discrete manufacturing, is a key initiative. Unlike discrete manufacturers, however, process manufacturers also have extensive needs for communications network integration that ties the sources of raw material to the processor, and the processor to the seller.

This sector continues to offer opportunities for process control, inventory control, and shipping control systems with heavy engineering and instrumentation content. Processes to be automated tend to be simple in overall concept but complex in implementation detail. Quality and environmental control and inspection systems with associated materials handling are focal points for systems integration projects.

Automation integration efforts to date were almost entirely focused on production and considered embedded systems that are not part of IS. Information systems and software projects concentrated on MRP/MRP II, accounting, inventory control, and statistics applications—with little integration involved. CIM applies equally as well to process manufacturing as to discrete manufacturing, but sees more discussion than application, except by Comserv, and even then only for MRP II.

3. CSI Potential

Unlike discrete manufacturing, process manufacturing firms are much slower to adopt CSI. Expenditures in 1989 are estimated to be \$133 million and the growth rate 20%—below last year's 25%. The smaller number of firms and the fewer number of major project starts sets these two industries apart, as seen in Exhibit IV-11.

Like discrete manufacturing, this industry has a competitive need to meet widely varying market demands. Participants need to unify and coordinate diverse data structures, process systems, and application developments, to support marketing and strategic management. A number of recent projects focused on network design and integration to aid in the unification process; these activities will expand to multiplant operations.

The improvement of operating efficiencies will concentrate on automation, MRP/MRP II, and production control systems that can provide higher capacity utilization with lower operating costs. These improvements are expected to contribute to reduction of capital investment risks.

IS managers see shortcomings of in-house project management and network design, but do not, in general, seem particularly inclined to pay an integrator for these capabilities. Interestingly, training and transition management is also highly valued in projects, but internal staffs appear

EXHIBIT IV-11

**Key Factors in Process
Manufacturing Industry**

- Positive
 - Competitive need to meet market demands
 - Need to improve operating efficiencies
 - Network design/integration requirements
 - Need support for marketing and strategic planning
 - Need for customized solutions
- Negative
 - Few large establishments
 - Slow decline in economy
 - Process concentrated in operations

to be inadequately prepared to provide it. In this market, support for marketing and strategic planning requires more sophisticated tools that are well suited to computer use, and that will add to CSI prospects. Each industry, and even specific companies, employ processes that will need customized solutions from vendors with industry knowledge.

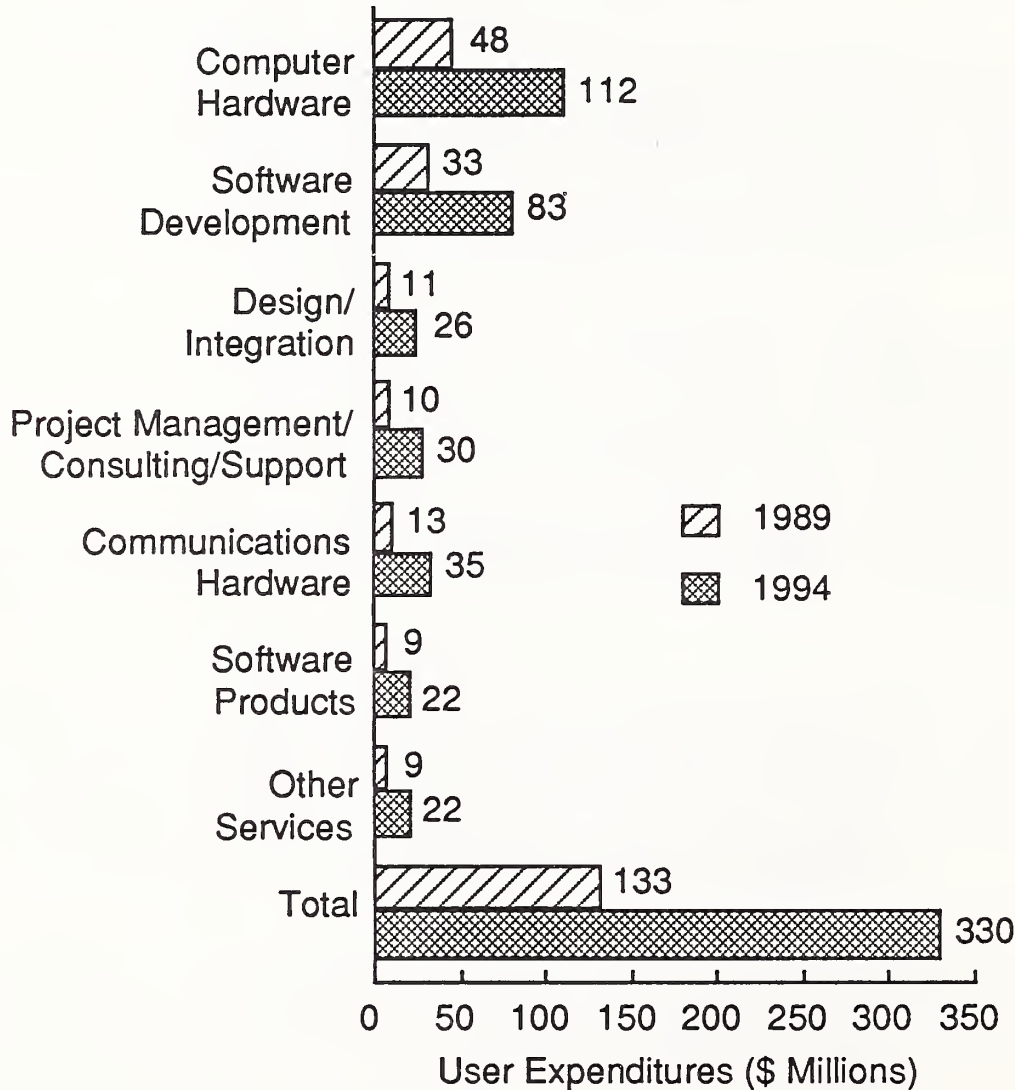
From a negative CSI perspective, there are few large establishments capable of supporting significant integration projects. Since the 1986 forecast, the number of firms has dropped, but revenues have improved by at least ten percent. The slow decline in the economy provides a warning of lower profits and an opportunity, if seen, to initiate automation projects for more economical operations. In this industry, the projects are concentrated on the operations side, which must be the focus of the potential CSI vendor.

4. CSI Forecast

The 1989 expenditures in this sector, as shown in Exhibit IV-12, are one-sixth the expenditures in the discrete manufacturing sector for all of the reasons given. By 1994, yearly CSI expenditures are expected to reach \$330 million. Computer hardware appears to edge out software development as the most important component, as was the case with discrete manufacturing, and just as computer hardware did in the 1988 forecast.

EXHIBIT IV-12

Process Manufacturing Industry Forecast, 1989-1994



The professional services components of project management, design, and integration appear smaller in relation to software development than in most of the other vertical markets because operations organizations employ more technical staff, and the ratio of information systems to production systems is smaller. Other services include instrumentation and process control specialists needed in CSI projects to meet technical criteria.

There are no principal competitors, but a number of potential partners for CSI exist in the group of heavy machinery and automation vendors in each vertical segment.

CSI contracts in this sector are in evidence, for example Andersen Consulting for food products, but are more difficult to come by and smaller in size, with one known exception: IBM performed a contract for \$250 million. Most of the vendors in the discrete manufacturing sector also win contracts in this industry. Among them are Andersen Consulting, CACI, CSC, DEC, and Harnischfeger. Other vendors include Coopers and Lybrand, CDC, Deloitte Touche, Bull NH, Ernst and Young, and McDonnell Douglas.

G

Retail Distribution Industry

The retail distribution sector includes single establishments and chains in apparel, food, appliances, drugs, hardware, etc.

1. Industry Forces

Mixed results were reported for this industry in 1989. Department store chains may have expanded too quickly and priced too high. Clothing, appliances, and food experienced lower sales volume in the face of buyer resistance. Chains such as K-Mart and Montgomery Ward had higher sales volumes, as a response to the discount approach. Drug, beverage, and specialty retailers saw growth in the 10% range, especially as services increased and margins declined.

There are only 800 large retailers among the more than one million companies that are the principal targets for CSI in the immediate future. The emphasis of these companies will be on improving and integrating external and internal communications.

Externally, communications with customers is very important. Better communication links facilitate the flow between customers, outlets, retailers, and wholesalers. The use of information systems for credit checking and POS data collection ensures the steady flow of funds while monitoring inventory. Back-office use of computer-to-computer order processing increases the speed of locating and delivering merchandise.

Internally, the primary use of automation thus far is applications for closely monitoring finances, supporting financial decisions, and analyzing profit margins, but not for providing strategic management decision information.

Although management is concerned with the increasing communications costs required to support broader networks, it believes that the use of technology is the only way to simultaneously control costs, track customer buying patterns, manage inventory, and match merchandise to demographic buyer interests.

2. Impact on Information Systems and Services

The mission of IS, given the broad diversity of products handled by each outlet, is to provide systems that control logistics associated with warehouse and shelf inventory, pricing and obsolescence of goods, etc., while also handling the logistics of credit/bad check verification, bad credit losses, cash handling, and funds consolidation and transfer.

IS is also expected to develop customer-oriented services for faster and simpler order entry, transaction processing, in-store processing (distributed processing), and the use of such technologies as EDI to reduce paperwork.

Provision by IS of real-time information for improved decisions by management means improved marketing/sales data, sales demand forecasting by demographic areas, vendor performance ratings, telemarketing systems, and inventory deployment models.

Increased integration of data processing and communications in the distribution industry appears to be essential to provide on-line connectivity of all operating elements, distributed processing to all locations, and end-user support throughout the organization.

3. CSI Potential

The shift to financial controls and demographic merchandising requires drastic redesign of outdated pricing and distribution applications. Integration of newer technologies—including simulation, expert systems, EDI, and decision support systems—is viewed as essential to maintaining a competitive position, as seen in Exhibit IV-13.

POS technology provides information that can be applied to inventory turnover, demographically based demand, advertising effectiveness, sales efficiency, and space utilization analyses that are rapidly replacing merchandising intuition as the basis for distribution decisions. Optical technology applications range from bar-code label readers to support POS and warehouse transactions to color-sample comparisons and broadband data communications for more error-free capture and movement of data.

Retail establishments have rediscovered the critical importance of customer service to insure repeat sales. Among the tools being employed are rapid credit checks and multiple payment methods, early warehouse response to local out-of-stock requests, telemarketing services, and accurate tracking of shipments to clients. All of these depend on rapid and accurate transfer of information that may exceed current systems capabilities.

EXHIBIT IV-13

Key Factors in Retail Distribution Industry

- Positive
 - Shift to financial controls
 - Increasing use of POS and optical technology
 - Strong interest in customer service
 - Network design and project management needed
 - Drive to higher inventory turnover
- Negative
 - Infrequent user of outside services
 - Smaller-than-average project expenditures
 - Prevalence of small companies
 - Low profit margins across industry

From a functional point of view, retail organizations are seeking outside help for communications network integration, voice/data integration, micro/mainframe connectivity, and office information systems integration. IS managers' analysis of their own in-house capabilities and constraints suggests that they feel the current staff is not available and/or does not have the technical capabilities required for these types of projects. Specific skills they require relate particularly to network design and complex project management.

Leaders in the retail industry are investing in better ways of increasing inventory turnover and reducing inventory excesses. Methods include EDI for rapid transfer of orders to production sources and suppliers and, in turn, shipment to specific outlets to minimize risky interim shortages of salable goods in demand. This provides a supply version of JIT that avoids overstocking and the risk of unsold inventories.

Small margins, low investment capital availability, increasing labor costs, and rising facility costs have discouraged frequent use of outside services, except when considered absolutely essential. Most information product or service acquisitions are piecemeal and build on existing resources.

Although the number of companies in the distribution industry that could support CSI is large, major project expenditures have been limited. The larger number of medium-sized firms have traditionally not been driven by the need for automated solutions as much as by merchandising skill. But this situation is changing, by necessity, as large wholesalers and retailers find their margins shrinking even further in a more competitive environment.

4. CSI Forecast

The forecast for this market shown in Exhibit IV-14 indicates strong growth potential in CSI expenditures (CAGR 38%) as the use of automation as a competitive weapon is felt from the display floor to the loading dock. By 1994, retail distribution expenditures for CSI are expected to grow to \$940 million annually from a 1989 base of \$186 million.

Interconnection of a wide range of existing resources with the new systems will drive software development higher than computer equipment over the forecast period. Software products will grow in the out-years, after the initial infusion of EDI and similar communications packages. Also, note that consulting services will be greater than project management fees.

Application areas are expected to extend from sales/marketing (sales demand/budgeting/forecasting, scheduling, sales tracking, telemarketing, order/entry processing, and credit checking) to management (payroll, retail accounting, human resources, accounts receivable, purchase order systems, and warehouse control).

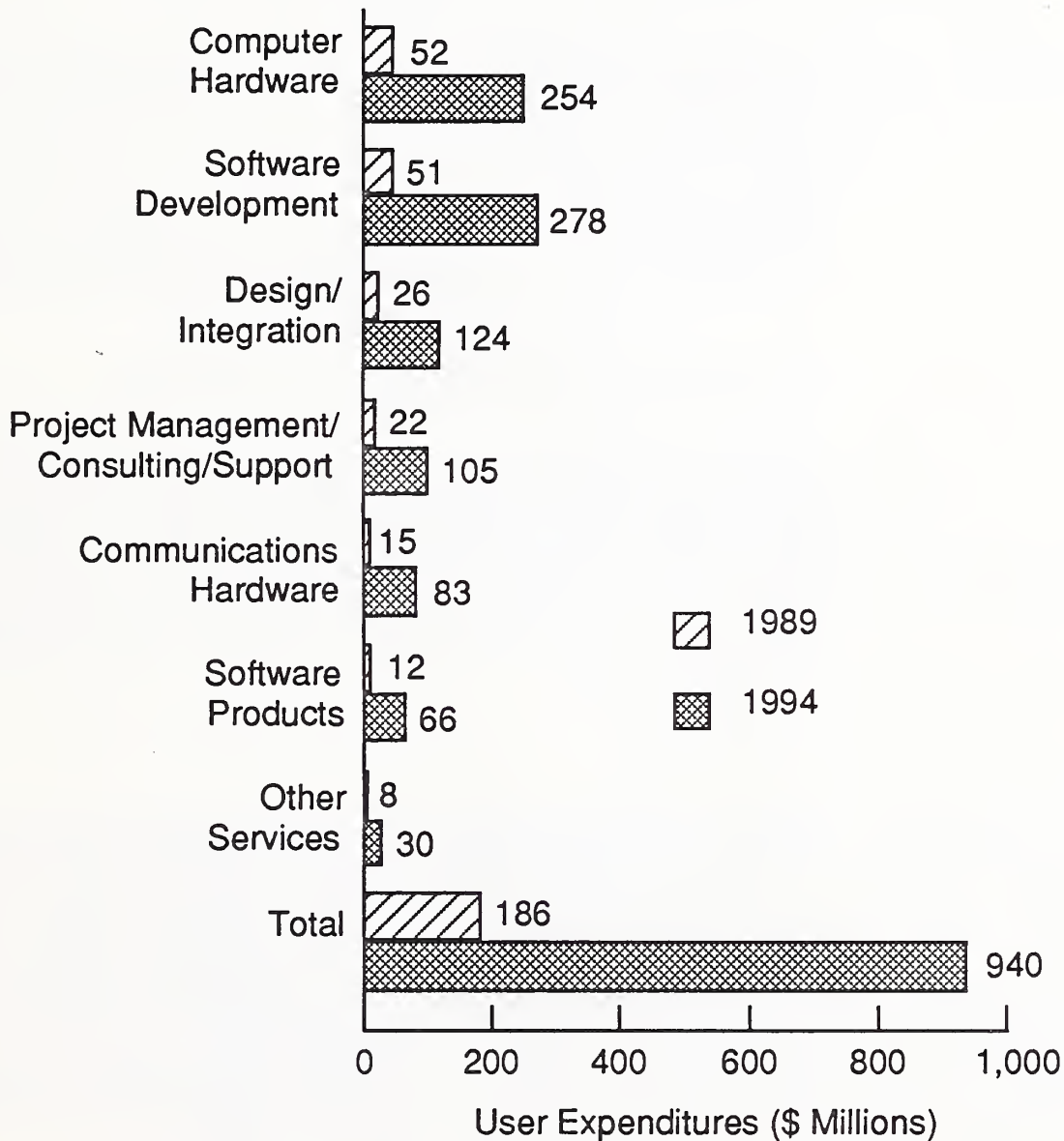
The use of outside CSI vendors for significant projects is not yet evident in this industrial sector. The largest recent awards involve network integration—with GTE, Hughes, AT&T, Illinois Bell, MCI, and Southwestern Bell winning some of these awards. The principal platforms are provided by DEC, IBM, and NCR. The most visible systems houses are CSC and EDS; Ernst and Young is the only reported Big Six firm. Spinoffs are emerging as new competitors. One example is Pennzoil's Strategic Information Services.

H

Services Industry

This sector is composed of professional services (e.g., accounting, legal, engineering), personal services (e.g., garment cleaning, reproduction, dwelling services), and business services (consulting, public relations, telemarketing).

EXHIBIT IV-14

Retail Distribution Industry Forecast, 1989-1994**1. Industry Forces**

Most of the services industry companies and partnerships are privately owned and thus not required to report the level or changes in revenue. Key among those that do report income are architectural and engineering, real estate services, advertising, public relations, and accounting firms. A&E, media, and advertising had improvements in 1989 of up to 20%. The remainder were negatively impacted by high interest rates and consolidations.

This sector is characterized by a very large number of small businesses, professional practices, and other groups that do not represent a target for CSI, but are suitable for turnkey vendors and other VARs. Only a few vertical submarkets appear to be worth structuring a specific marketing effort for smaller CSI vendors, but the entire market is primarily opportunistic.

Automation of functions has not played a significant role to date in the development of this industry. Recent interest in information accumulation, handling, and disposition led to new starts in information networks and textual and statistical data bases, for service and trade associations, and the general information industry. These markets have experienced notable growth recently as their services have become more attractive and cost-effective to small and large organizations that need the support but prefer not to invest in internal organizations.

2. Impact on Information Systems and Services

Because this sector is characterized by small business, professional practices, and partnerships, the IS function is significant only in the largest firms and associations. Accounting, legal, and engineering seem the most susceptible to CSI, but on a smaller scale. Because many have either leased processing services or employ PC-based resources, they are ready to invest in new technologies to provide enhanced services in expanding markets.

3. CSI Potential

Although not sharply focused, there are new demands for networks and on-line data bases or data base support facilities, as noted in Exhibit IV-15. A number of service organizations are large enough with increasing needs to support a limited number of CSI projects. The service organizations include conference and exhibit corporations; national and international real estate leasing and sales organizations; and national professional, trade, and technical associations. Service sectors are organizing support systems that are jointly owned or fee-based for member groups.

Demand for more-responsive services appears to be creating new system demands, however. On-line systems, with supporting data bases, will be needed to comply with increasingly complex tax laws to all levels of government. Record retention and multiple filing requirements can be expedited with better data processing capabilities.

On the negative side, even the largest segments present few large-scale opportunities. In some sectors (Big Six accounting firms, large engineering companies) the capabilities exist for in-house management of major projects, which will lessen the size of the CSI market even further. New technologies are gaining wider acceptance, but there appears to be minimal use of, or opportunities for, automation.

EXHIBIT IV-15

Key Factors in Services Industry

- Positive
 - New demands for networks and data bases
 - Key service sectors organizing support systems
 - Markets creating new system demands
 - Increasingly complex tax laws
- Negative
 - Few large enterprises
 - Economic uncertainty
 - Few large-scale opportunities
 - In-house control of large client systems

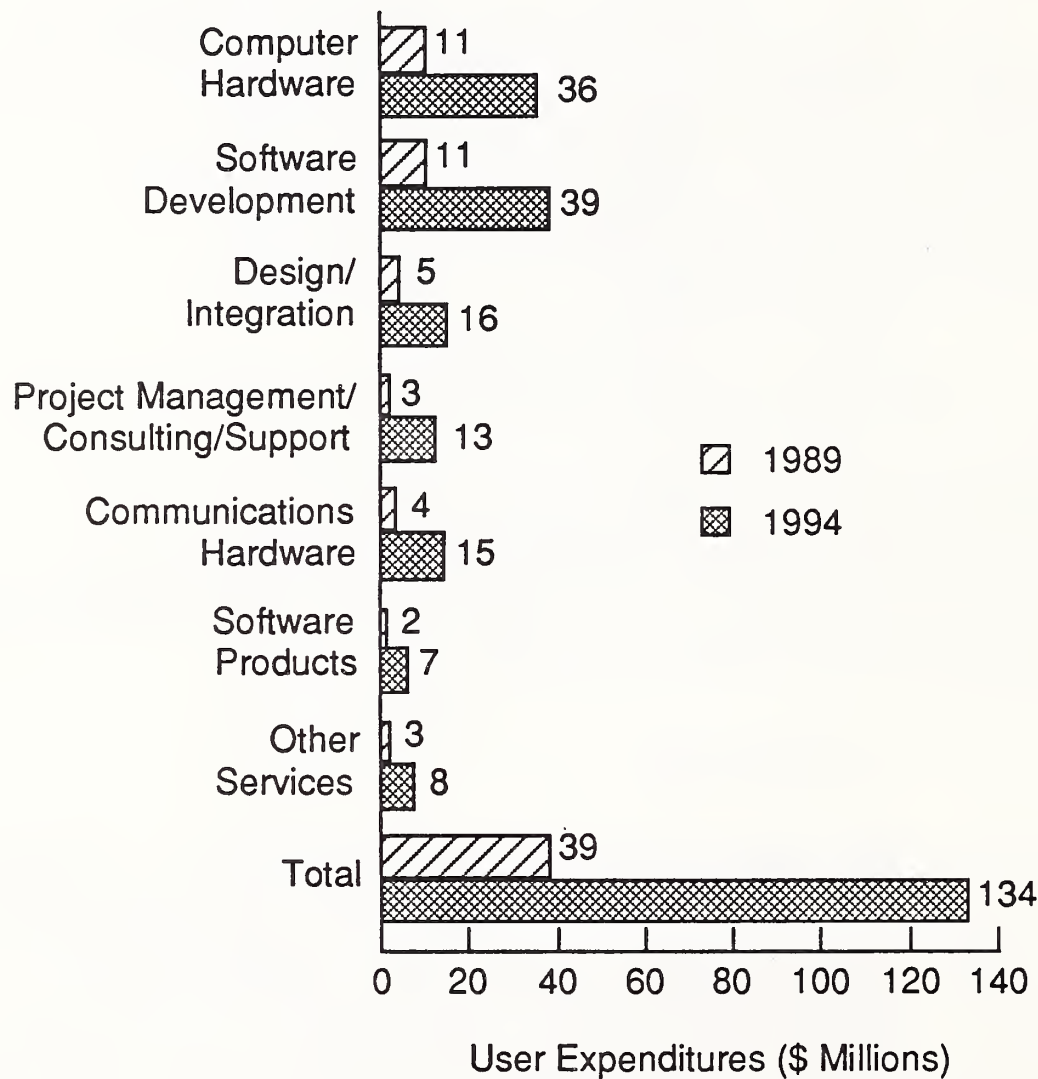
4. CSI Forecast

The forecast for this sector shows, in Exhibit IV-16, continued limited CSI potential, with only \$134 million in yearly CSI expenditures by 1994 from a small base of \$39 million in 1989. The 1989 and 1994 forecast values are significantly larger than those projected earlier, in recognition of the continuing mergers of small service organizations and a surprising demand for their services. This growth represents prospects for specialized software development and new hardware, most likely for the new workstations with the power of mainframes for desktop publishing and graphics. The communications hardware component is comparatively larger than other sectors because of strong network interest.

There are not many SI vendors in this limited market. IBM is the principal computer equipment provider. GTE and some small communications houses provide network integration. BCS, GDS, and SHL Systemhouse have installed integrated systems in the marketplace, and can be expected to continue.

EXHIBIT IV-16

Services Industry Forecast, 1989-1994



I

State and Local Government

This sector includes city, county, regional/district, and state government bodies, particularly those involved with public safety, highways, welfare, education, health and social services, and sanitation.

1. Industry Forces

Much like the federal government, state and local governments have come under greater financial pressures as requirements for services increase without corresponding improvements in the tax base. The

passage of the Gramm-Rudman-Hollings Deficit Control Act had an immediate and continuing impact on federal support of state governments. CSC, IBM, Arthur Andersen, and EDS look to this sector to generate significant revenue opportunities in the next five years.

If past contracting patterns continue, 45% of state and local government expenditures will come from state governments, 30% from cities, 14% from counties, and only 11% from districts and other authorities. Proposals to move more data processing activities in-house have been blocked by staff retention problems and demand growth that continues to exceed available in-house resource capacity. Use of contract services is seen as more economical and politically more desirable, since it avoids increasing government employment levels.

2. Impact on Information Systems and Services

The mission of information systems departments in state and local governments has broadened considerably in recent years. Despite budget limitations, the demand for new services, especially on-line systems, has increased for health and social services, tax and fee collection for licenses, court and criminal justice needs, real estate construction/inspection/assessment data, voter/vehicle and business registration, and public safety and civil aid services.

Most of the older government information systems that operated in the batch processing mode have been replaced by interactive on-line service systems. Replacement or upgrade of hardware and software to meet new requirements has been met by standalone workstation, PC-based, or turnkey systems—or by contracted processing services. The variety of solutions has not been amenable to integration or shared data bases.

Connectivity between systems has been resolved at state and large metropolitan centers by reliance on commercial networks from the common carriers. Network implementation between office information systems, the larger data processing systems, and contracted services still requires attention in the medium-sized facilities of counties and districts.

However, cutbacks in staff and the inability of government agencies to remain competitive with private industry in salaries for technical personnel has resulted in a shortfall of qualified in-house staff. This shortage creates a natural opportunity for CSI vendors.

3. CSI Potential

The need for integrated systems in this government sector is growing. Some integration projects will likely be very large, making this sector attractive, as noted in Exhibit IV-17. The principal customers will be the

industrial and coastal states, large metropolitan centers, and a few large counties that have the financial resources and demand for improved services.

EXHIBIT IV-17

Key Factors in State and Local Government Market

- **Positive**
 - Continued demand for new technology
 - New program and service demands
 - Shortfall of qualified in-house staff
 - Increasing network and resource-sharing demands
- **Negative**
 - Dispersed market (82,000 government units)
 - Emphasis on local vendors
 - Federal revenue-sharing ended
 - Interest in small turnkey solutions (VARs)

If the legislative emphasis on increased use of in-house data processing prevails, the shortfall of qualified project managers and technology specialists on in-house staffs would substantially increase CSI prospects. Executives and governing bodies want integrated systems that can share data, provide planning services and information on public issues, assure the integrity and security of personal data, reduce current maintenance backlogs, and offer more timely budget and financial data. Software tools that support analyses of alternative solutions to public sector problems are desired by regional and district officials.

One interesting window of opportunity appears to be systems operations (SO) contracts. It is not uncommon for vendors to extend CSI projects into SO contracts on completion. Conversely, a number of CSI projects grew out of SO contracts for operating existing but older systems, particularly at the larger county government level. By the end of the project, the contractor is well known to the client and has a better understanding of the system than anyone, including the client.

Unfortunately, this market is large (82,000 government units) and geographically dispersed, presenting a significant problem for marketing and sales activities. The wide separation of opportunities also appears to foster greater dependence on local vendors that may lack adequate support staffs.

Despite the urgency of the need, many information industry vendors find it difficult to compete because the roles and influence of officials, IS management, and advisory groups are not always clear, and some decisions seem arbitrary or political. This latter aspect indicates the reason that locally based VARs have been more successful in the smaller counties and communities in furnishing turnkey system solutions.

The impact of federal budget deficit controls has been felt down the line to counties and districts previously supported by the local presence of military and civil federal facilities. Proposed closure of military installations and reduction of concentrated civil agency facilities are expected to reduce near-term CSI prospects.

4. CSI Forecast

Exhibit IV-18 shows that the forecast for this sector acknowledges that state and local governments are the second largest CSI opportunity market after discrete manufacturing. This sector is expected to grow to almost \$1.4 billion in 1994 from a base of \$465 million in 1989—a CAGR of 24%. In 1989, this market surpassed banking and finance, and is expected to remain in second place during the forecast period.

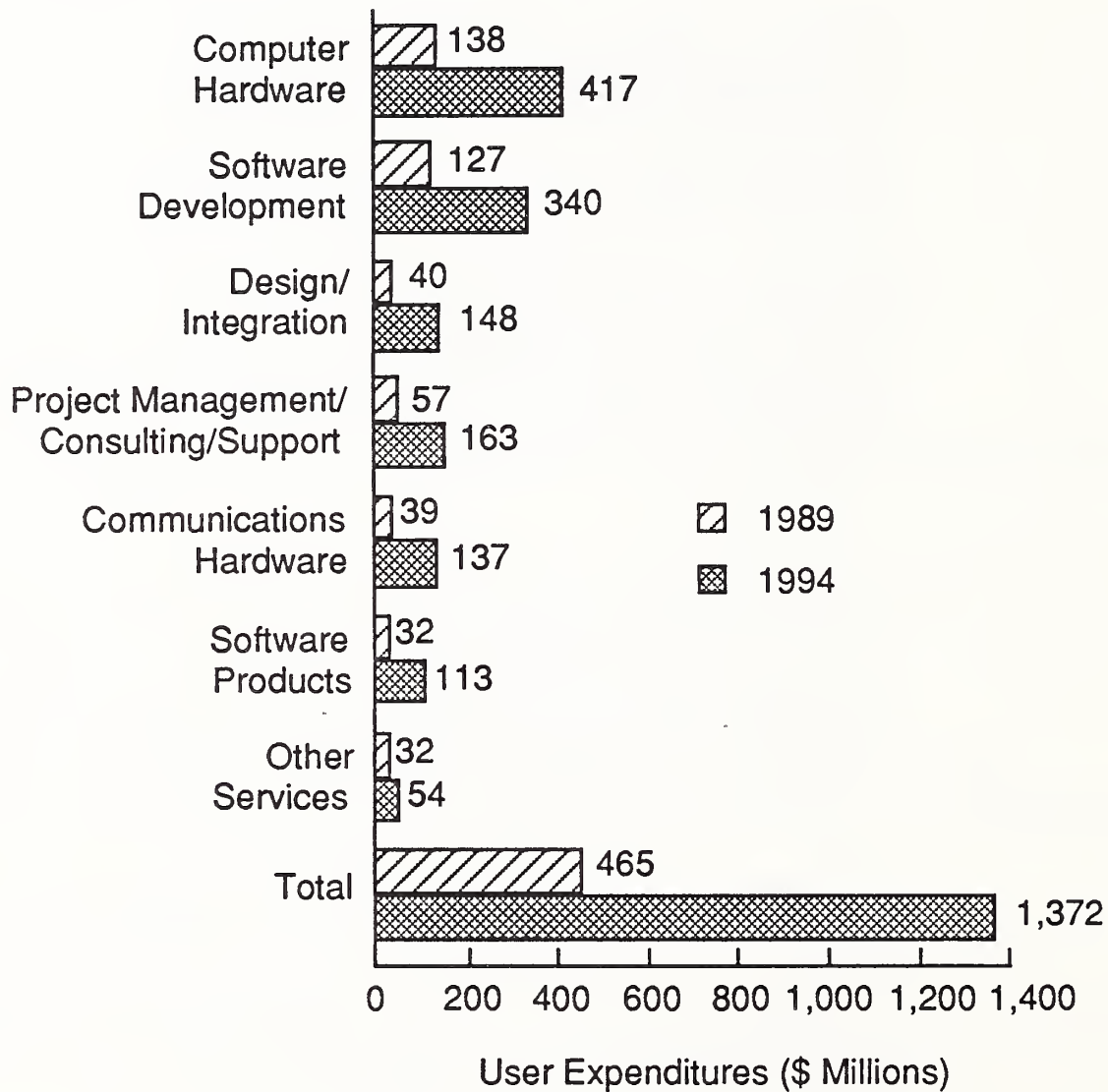
Computer hardware is expected to be the largest component, at \$417 million in 1994, based on the need to replace much of the current inventory. Although software development has the second largest growth prospect, at \$340 million in 1994, increasing use of off-the-shelf software will provide about \$113 million of revenue by 1994. Increasing investment in both internal and external networks should result in \$137 million of expenditures for communications hardware in 1994.

The uncertain future of funding through state and local taxes could result in much lower growth over this period. The governmental entities could increase process contracting using vendor-owned resources, or continue reliance on only moderately enhanced information resources.

The leading CSI vendors in this market are: Andersen Consulting, BCS, CSC, EDS, Federal Engineering Inc, IBM, PRC, and SHL Systemhouse. Network integrators include AT&T, C&P Tel., GTE, Illinois Bell, Nynex, PacBell, and Sprint. Other vendors identified with this market include Coopers & Lybrand, Ernst & Young, Keystone, SCT, SAIC, Digital, NCR, Unisys, and McDonnell Douglas.

EXHIBIT IV-18

State and Local Government Forecast, 1989-1994



J

Telecommunications Industry

This sector is composed of the major providers of telecommunications (AT&T, MCI, Sprint, GTE, Contel, the Regional Bell Operating Companies (RBOCs), independent local exchange carriers, long-distance resellers, 800 and 900 services, and cellular operators) as well as companies providing broadcasting, cable TV, and optical fiber and satellite networks. As the media available for information transfer become more varied, this sector may be better described as the “electronic communications industry.”

1. Industry Forces

The industry posted minor growth in 1989, except for MCI and United Telecom/U.S. Sprint, which had substantial gains. AT&T and Sprint are the principal (60%–40%) suppliers of the new federal FTS-2000 voice/data service. Ameritech, Contel, and U S West saw minor setbacks, but have enough potential to recover in 1990. Fiber optical cable and satellite capacities increased domestically and overseas, with definite impact on profits. There were some failures in partnering over the year.

Many telephone companies and RBOCs have formed international units for off-shore sales, just as foreign telephone companies and their subsidiaries are moving into the U.S. market. Some of the more notable firms include Nippon Telephone & Telegraph (NTT), Hong Kong Telephone Company (Comput Asia), Siemens, Alcatel, and Norway EB Telecom.

Cellular operations and cable TV companies are offering Teletex, data transmission, interactive on-line data services, and other features that approach the concept of a computer utility available to the general public. State and federal regulations affecting these services have been relaxed to foster competition.

2. Impact on Information Systems and Services

In addition to the competition that deregulation fostered, Bell telecommunications companies lost a major source of IS support when they were separated from AT&T. This lost capability is now replaced by in-house capabilities or by external contractors. Bell companies also lost data-processing resources to cost-cutting measures, creating even greater opportunities for CSI vendors.

The new and emerging information carriers—such as cable TV, TEL-ETEX, and cellular systems—are already using IS to operate billing, traffic and programming management, maintenance scheduling, and marketing programs. They note the need for assistance in providing the capability for planning, flexibility of services, and connectivity between operating elements.

3. CSI Potential

Telecommunications firms, although few in number, tend to undertake projects that are significantly larger on the average than the other industry segments. These characteristics tend to be offsetting, making this sector moderately attractive in terms of overall expenditures.

Hardware requirements tend to be below average, whereas custom software development efforts and the design and integration activities required to connect the components are quite large. These expenditures, as a proportion of the typical project, are above average.

Telecommunications companies are attractive to CSI vendors because the program management methods provide the project discipline so frequently missing in recently deregulated businesses. These organizations feel that they can more readily contract project management skills than try to supplement their own in-house capabilities, as noted in Exhibit IV-19.

EXHIBIT IV-19

Key Factors in Telecommunications Industry

- Positive
 - Internal lack of project discipline
 - Network integration opportunities
 - Widening range of services requiring support
 - Need for EDI and AI-based systems
 - Commercial impact of FTS 2000
- Negative
 - Industry restructuring delays projects
 - Perceived in-house technical skills
 - Highly unionized workforce
 - Foreign vendor interest

Network integration is an important consideration in most projects, as are micro/mainframe links; office information systems and voice/data integration are not. The telecommunications vendors believe that they know more about network integration and management than the noncommunications CSI vendors.

Among the services that communications suppliers desire for improved operations support are EDI (with format subsets like VICS and EIDX), expert systems and service modeling, and AI-based service control systems.

Restructuring of the industry and the entry of a new type of competitor have narrowed profit margins and delayed the early availability of investment funding needed to initiate CSI projects. The regular telecommuni-

cations suppliers believe they have the necessary in-house technical skills to complete integration projects.

As noted in earlier SI investigations of the success factors, automation and integration projects can change the way the organization works, introducing culture shock to the ultimate users. Under certain conditions, the highly unionized workforce characteristic of this industry can provide serious opposition to the introduction of new systems that may appear job-threatening.

Foreign vendor interests in the U.S. domestic market may involve importation of their own systems integration people, instead of seeking U.S.-based SI vendor assistance. The level of impact will depend on the success of foreign firms identified earlier.

4. CSI Forecast

The forecast for this sector shows growth from a base of \$150 million in 1989 to \$385 million of annual expenditures for CSI by 1994 as shown in Exhibit IV-20. The CAGR of 21% is the fourth lowest of the vertical-industry markets surveyed, but up from the 18% predicted in 1988. As noted in the earlier analysis, custom software development is expected to be the leading component, with only a small amount of off-the-shelf software applicable to this market.

Given the limited number of major establishments, projects already under way, and a "parochial" attitude regarding some CSI skills, this can be a difficult market to penetrate for all but a few. Computer manufacturers and industry-specialized professional services vendors (e.g., CSC, EDS, H-P, IBM, SHL Systemhouse) are the prime CSI competitors. Andersen Consulting and Unisys are active on recent CSI projects.

K

Transportation Industry

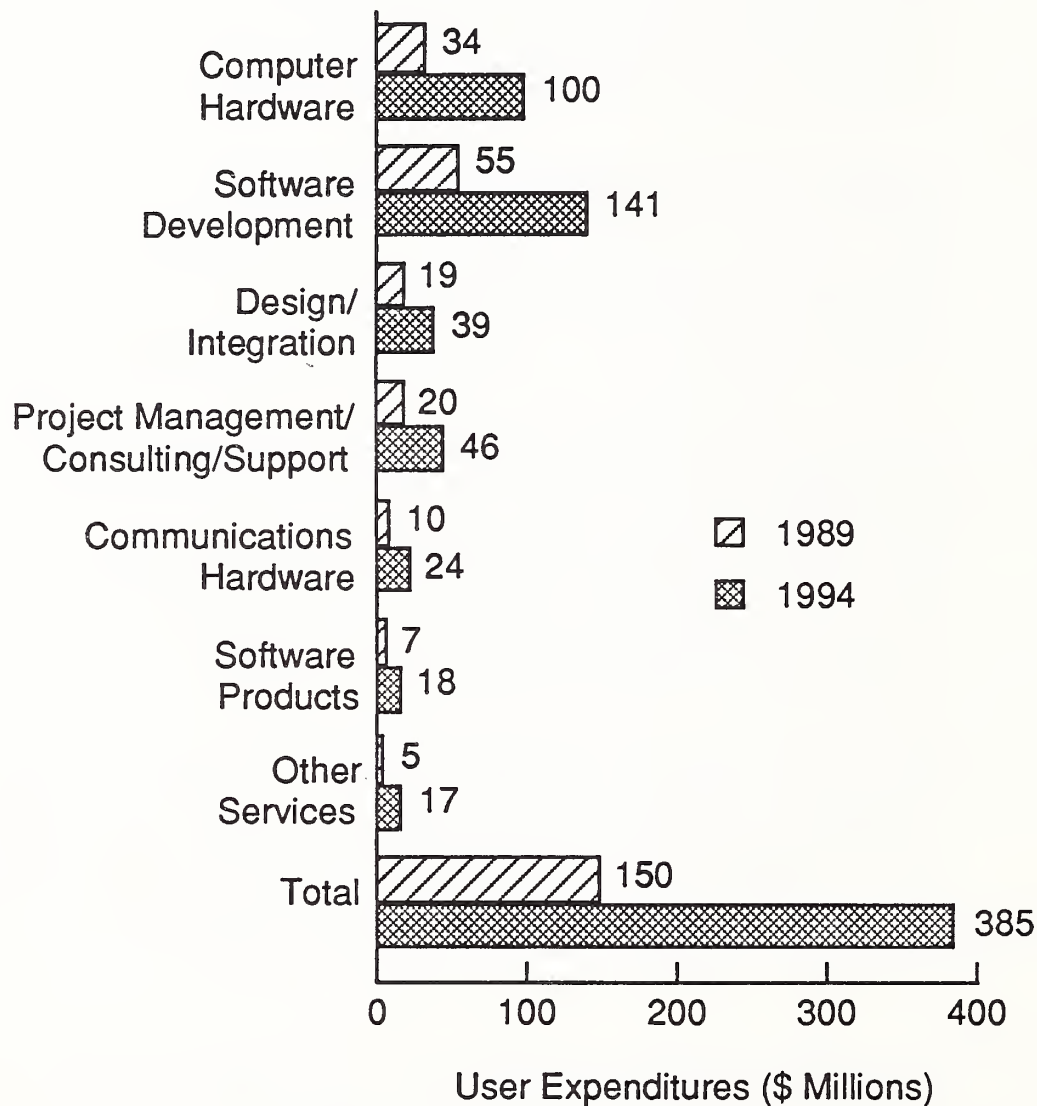
This sector is composed of airlines, railroads, trucking, and other transportation—including shipping, mass transit, postal, and pipeline services.

1. Industry Forces

This industry performed poorly in 1988 and 1989 because of the downturn in the economy, environmental concerns, and labor unrest. Toward the end of 1989, concern grew again about the rising cost of fuel as imports gained over domestic production. Marine transportation revenues fell with lower cargo volumes and rising concerns about raw material transfers, in light of an increase in ship accidents. The coal strike and decreased car loadings led railroads to experience a decline that created a new round of discussion about continuing government operation. The profits of CSX and Santa Fe Pacific came from nontransport sources.

EXHIBIT IV-20

Telecommunications Industry Forecast, 1989-1994



Increased use of less-than-full-truckload shipments and double trailers helped trucking to increase revenues. Threatened rate discounts could cut margins in 1990-91. Air freight shipping also increased, along with scheduled passenger traffic, except for Texas Air/Continental/Eastern and its strike. Restructuring and mergers are expected to contribute to a decline in the industry revenues and profits.

Air cargo and air-express competitors have added automation, extended data communications, and bar-code readers to their arsenal of competitive weapons. Intermodal shipping companies that combine rail, road,

and water transportation are on the increase, with several employing sophisticated load-modeling tools to improve efficiencies.

2. Impact on Information Systems and Services

Limited growth in IS expenditures is expected as transport firms control costs and remain competitive. Productivity and efficiency are paramount in reducing personnel costs. IS organizations have been kept small and productive.

Part of the strategy is replacement of personnel with technology-driven systems. Technology lowers the cost of overall service by reducing labor costs and at the same time improves the speed of response required to remain competitive. Systems are necessarily communications intensive. Travel reservations systems, crew and maintenance scheduling, and route and load optimization modeling are the current backbones of the industry.

These systems, when properly designed, also provide management with better information for statistical analyses of operations data, rapid response to changing market prices, cost savings to labor and fuel, carrier scheduling, and sales/marketing planning and analysis.

3. CSI Potential

The deregulation of this industry fostered a competitive environment that demands the use of automation technologies as a competitive weapon. Price wars based on more progressive tariff structures have cut so dramatically into revenue that funds for major projects appear limited. The industry includes only a limited number of large transportation companies, thus significantly reducing the attractiveness of this industry for CSI, as seen in Exhibit IV-21.

There are major opportunities and projects that tend to be larger than the average of other industries. Major expenditures in these large projects involve communications hardware and design/integration services that can support a strong industry need for end-to-end systems that can maximize customer satisfaction and repeat business.

The competitive battleground is largely in the reservation systems required for securing, at a guaranteed price, space for the movement of people or cargo. Since prices seem to change daily with deregulation and the agents who need this up-to-date information are dispersed over vast areas, complex networking capability is paramount to the industry.

CSI will be attractive to client organizations that want to solve problems of how to make changes to a complex system easily and without interrupting ongoing operations mode. CSI vendors can offset the recognized technical weaknesses in internal staff as well as their limited capabilities

EXHIBIT IV-21

Key Factors in Transportation Industry

- Positive
 - Competition/changing rates require support
 - Competition of intermodal systems
 - Network design/integration requirements
 - Move to independent traffic management
 - Automated systems as competitive tools
- Negative
 - Few opportunities outside of airline segment
 - Little growth in IS expenditures
 - Limited use of outside services
 - Limited capital investment availability

in project management. Vendors should be prepared to address the concern of many IS managers regarding the directions of IBM and the hardware that is likely to survive.

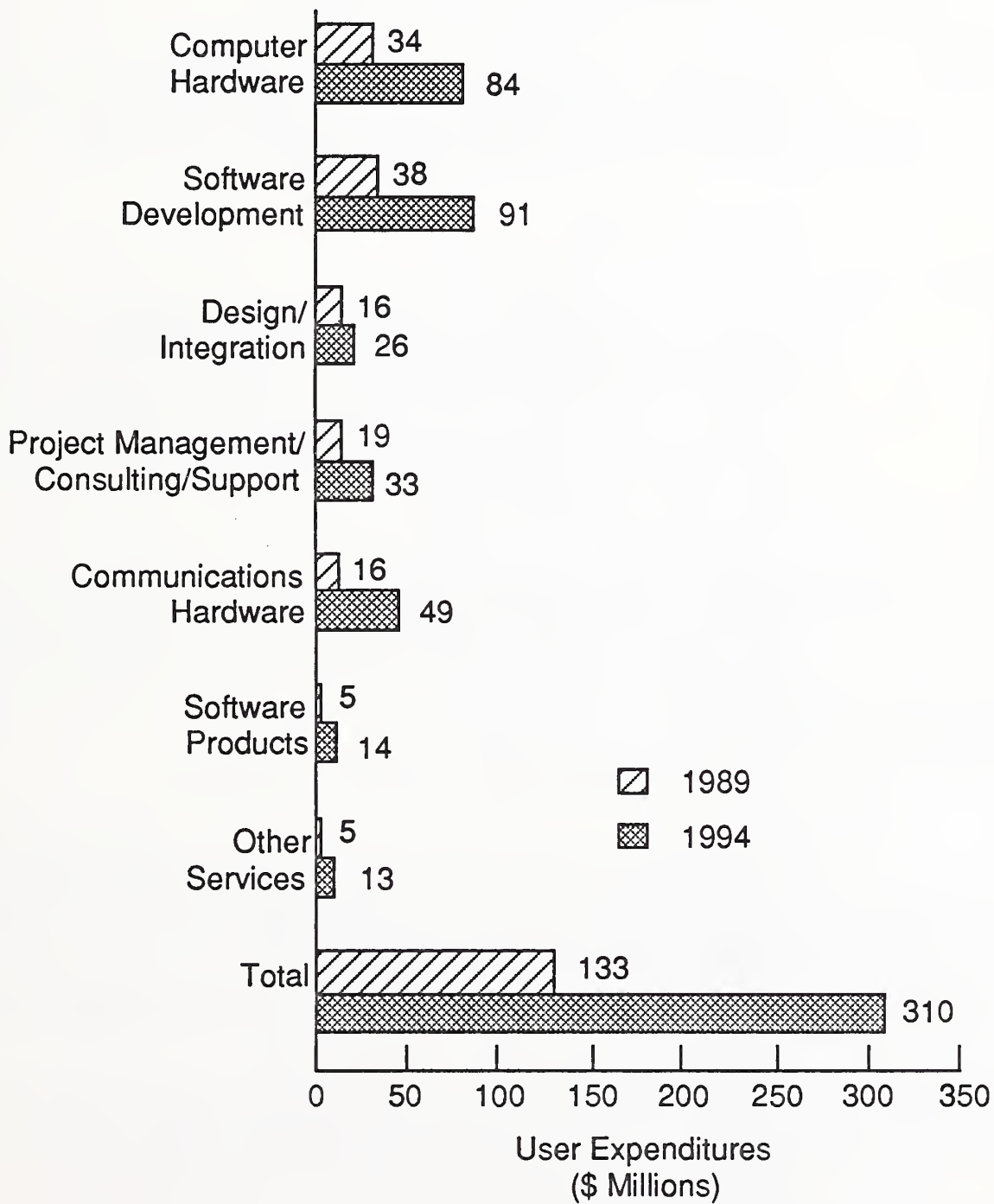
The most unattractive features of this market are the limited number of projects and the low level of anticipated expenditures outside the airlines segment. Beyond major airlines, the industry is not economically capable of supporting many large projects. These other segments are not particularly accustomed to the use of technology or the need to acquire development expertise. Increasing labor-and-materials costs for operations have limited capital available for investment.

4. CSI Forecast

The forecast for this sector, seen in Exhibit IV-22, shows that from base of \$133 million in 1989, CSI yearly expenditures are expected to grow to \$310 million by 1994—a CAGR of 19%, the second lowest growth rate of all vertical markets. This rate is lower than forecasted in 1988, when consolidation of some reservation and traffic management systems began. The new rate reflects the current softness of the industry, which may not support the investment needed for aggressive CSI projects. Software development and hardware acquisition are nearly equal-value components, considering the industry's special but limited requirements.

EXHIBIT IV-22

Transportation Industry Forecast, 1989-1994



Communications hardware is expected to play a significant role in the demand for extended connectivity.

The principal competition for CSI projects is expected to come from computer manufacturers like IBM and Unisys, which team with smaller, industry-specific vendors like AMCI. Andersen Consulting, EDS, Lightnet, PST, and Rockwell have also become evident in this marketplace in the last three years. The number of significant competitors is expected to remain small.

L

Utilities Industry

This sector includes the energy market (electricity generation and coal/nuclear/hydro/oil/solar/geothermal/gas energy production), water utilities, and sewage/waste disposal and treatment, but excludes telecommunications.

1. Industry Forces

The sector saw slight gains in 1989, with state regulations not seeking another round of rate cuts. Several states are emphasizing conversion of smaller nuclear plants to fossil fuel—for example, New York's Shoreham plant. Continued commercial and residential construction, including major shopping malls in several regions, continues pressure on the utilities for mergers, improved cooperative load sharing and a search for funds for more facilities.

The poor condition of utility balance sheets results from the enormous cash drain many utilities have suffered as a result of litigation, project overruns, environment clean-up measures, and, in particular, nuclear power plant construction. Poor balance sheets are unlikely to be resolved in the near future.

2. Impact on Information Systems and Services

IS has been forced to shift from a comfortable day-to-day operating orientation to one where IS must meet dynamic demands within constrained budgets. Management has directed IS to help in enhancing operating efficiency and productivity to make the utility more profitable and reduce costs while increasing the ability to serve users. Cost containment remains the principle focus of all operations support activities.

IS management's attention is turning to data communications requirements that will make systems available to users, even at remote locations. Many of the support systems are being changed from batch to on-line, and issues regarding the proper use of advanced technologies and distributed versus central processing are now being addressed in new systems.

3. CSI Potential

Utilities are discovering the use of technology for maintaining a competitive edge. Customer files are becoming marketing data bases to improve service to customers and to market new products. AI-based automated process control is helping to minimize materials consumption and optimize resource applications, as noted in Exhibit IV-23.

EXHIBIT IV-23

Key Factors In Utilities Industry

- Positive
 - Increasing competitive use of technology
 - Hardware/software obsolescence
 - Automation of repetitive tasks
 - Automated electrical grid control
- Negative
 - Day-to-day orientation of IS
 - Limited number of establishments
 - Financial constraints
 - Modular, rather than total, view of system

There is much more interest in long-term hardware planning and the curtailment of rapidly escalating operations and management costs associated with outdated equipment. Corporate management appears to be more aware of the role of IS in responding to the growth of end-user computing, the need for better data administration, and the collection of data for demonstrating compliance with federal and state regulations. End users are buying more ADP power and making the IS director more of a data manager and technical coordinator than head of information processing.

Despite long-term opposition to the use of automation to remove, or reduce drastically, the role of people in controlling utility operations, management has begun to employ computer-aided equipment that will perform repetitive tasks with minimal supervision. This equipment can become part of a CSI project. Automated remote-control applications made possible by new technologies are also being targeted by utilities.

Among the negative factors to the extension of CSI in this market is the continuing day-to-day orientation of IS and their reluctance to expand beyond current capabilities. Another factor is the limited number of large utility establishments, particularly in gas and electricity.

Under the consumer-oriented constraints imposed by regulatory and environmental authorities and the resultant low ROI, investments are limited and prevent implementation of a number of desirable improvements in data and control systems. Operating executives have modular, rather than total, views of the systems; their perspective is restricted to raw materials, processing, maintenance, or customer relations. Traditional views are slow to be modernized in this basic industry.

4. CSI Forecast

Exhibit IV-24 shows that the forecast for CSI in this sector is approximately \$220 million in 1989. By 1994, these expenditures will climb to \$785 million at a CAGR of 29%, less than the 32% projected in 1988.

IS hardware and custom software development expenditures will dominate most projects. The large utilities have a strong interest in modernizing their systems to include applications for estimating user demands for electricity, gas, and water. Equally strong are the interests in developing and implementing automated systems for the collection of usage data.

Since many of the operations and accounting applications are new, there will be minimal demand for off-the-shelf software packages. Customized software will be needed for hazardous conditions monitoring, load-and-exit control, distribution and collection station control systems, and more modern customer service systems.

In view of the limited opportunities in this market, only a few CSI competitors are prominent. CDC and IBM lead among hardware-based vendors; Telenet appears in network and distributed processing projects. Bechtel, Fluor, Systems Control, EDS/GM, Telenet, and TRW appear as hardware-independent systems vendors.

M

Wholesale Distribution Industry

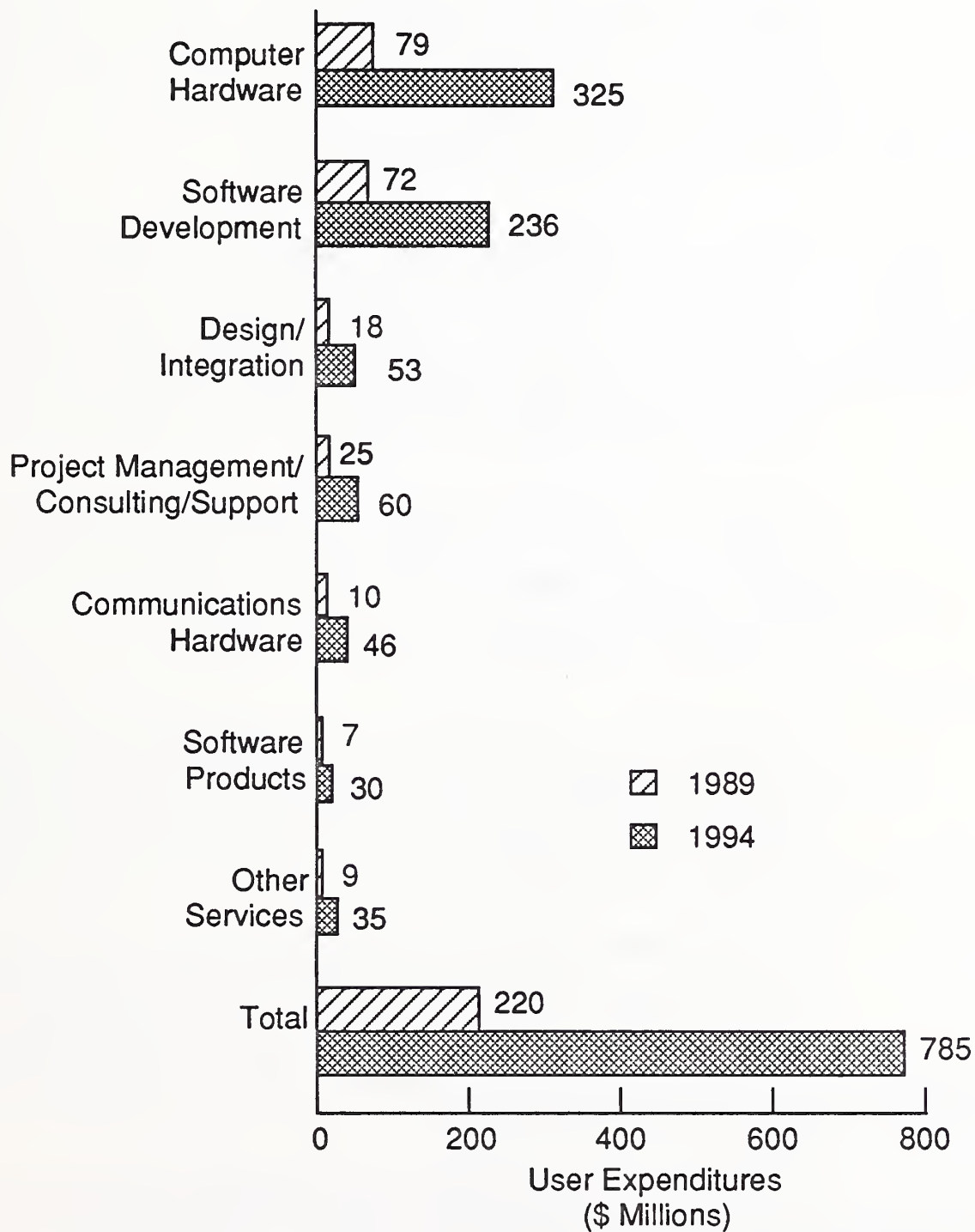
This sector includes establishments that sell goods to retailers or industrial/commercial/institutional groups acting as brokers.

1. Industry Forces

The wholesale distribution market includes a number of widely different submarkets with equally different growth rates. Some very large wholesale establishments are leading-edge users of information technology—but many more, in the thousands, are very small and do not employ the technology. There are three types of firms: independent distributors

EXHIBIT IV-24

Utilities Industry Forecast, 1989-1994



(merchant wholesalers), which account for about 55% of sales; manufacturer's sales branches, which generate about 35% of sales revenues; and agents and brokers, which handle somewhat less than 10% of sales and whose numbers are diminishing.

Most of the sector saw some growth in 1989, ranging from 2% to 18%. Winners included paper, chemicals, petroleum, machinery, lumber, and farm products. Areas that lost market share or revenue were autos, auto parts, furniture, and metals—by as much as 29% from 1988. The impact on IS is unclear because firms with losses are now moving to improve their market positions with updated resources.

Measures to ease the pressure on margins include increased inventory turnover, secured high-volume purchases, longer and larger purchase commitments, and automation improvements that contribute to the bottom line by enabling rapid response and deployment of products. Better communications will accelerate the information flow between wholesalers, retailers, and manufacturers/sources of goods. Back-office use of computer-to-computer order processing will reduce the time needed to locate and deliver merchandise.

Automation is viewed as a matter of survival by the independents and manufacturer branches. The leaders forecast an aggressive computerization solution to current margin pressures.

2. Impact on Information Systems and Services

IS in the medium- to large-sized wholesale organization is faced with meeting rising management expectations and satisfying increasing demands for the integration of data and applications, while managing the limited technical investment. The mission is complicated by the traditional instability of the sales-oriented organizational environment and its varying use of information services.

IS is also faced with the increasing importance of data integrity in an environment where PCs are beginning to proliferate in management. Proposed solutions must be proven in the market or submarket to support early payoff. Integration problems abound from the piece-meal installation of hardware and packaged software, supported by in-house or short-term consultant professionals.

Productivity of the IS staff is frequently impacted by varying backlogs of short-term or one-time application demands. Users in sales, management, and traffic are demanding increasingly complex tools, such as new workstations, upgraded applications, and on-line teleprocessing to gain a competitive edge. To meet these demands, IS is looking to applications that run on less expensive computers, expanded connectivity, and network techniques such as EDI.

Conversely, the cost constraints limit the level and availability of in-house staff to address these issues with the latest technology while meeting day-to-day service requirements. In addition, IS managers are having difficulty gaining any meaningful insight into future industry directions that would influence the selection of information technologies.

3. CSI Potential

There are about 30,000 wholesale distributors with \$5 million to \$20 million in sales per year; 6,000 have revenues in excess of \$25 million and 1,000 or more employees each. These firms are expected to be the principal sources of CSI opportunities.

Near-term industry interests will emphasize improving and integrating external and internal communications as noted in Exhibit IV-25. EDI between trading partners in retail, wholesale, and manufacturer/merchandise sources can be provided by network service firms like GEIS, ADP, and McDonnell Douglas, or incorporated into new dedicated networks as part of upgraded data systems.

EXHIBIT IV-25

Key Factors in Wholesale Distribution Industry

- Positive
 - Network requirements for retailers
 - Potential for EDI applications
 - Strong interest in inventory controls
 - Automation needed for survival
- Negative
 - Cost pressures/low margins
 - Smaller-than-average project expenditures
 - Widely different submarkets
 - Many small wholesalers

Improvement in control of inventory turnover rates to reduce financial pressures and risks is expected to gain early funding. Only a small number of wholesalers are currently employing distribution resource planning (DRP) with inventory modeling, automated warehouses, and OLTP resources. More of the firms are expected to move in this direction to remain competitive. Automation is needed for survival, and the more progressive managements will adopt CSI programs, if the contribution to the bottom line can be demonstrated.

Like the retail distributors, wholesale distributors have not made use of outside services except for hardware maintenance and essential software support. In an industry largely guided by merchandising intuition, using relatively small IS staffs, and financially constrained by narrow margins, there have been smaller than average CSI project expenditures.

Part of the problem is attributable to the existence of widely different submarkets, where CSI vendors' experience might be seen as relatively narrow. Each submarket sees itself as having unique requirements that can only be addressed by knowledgeable specialists.

From an information technology viewpoint, however, this market offers broad applications challenges which could be addressed by technology and tools already employed successfully in other markets. The marketing of CSI capabilities may have to be shaped to offer phased improvements over time, to stay within the stringent cost envelope of the industry.

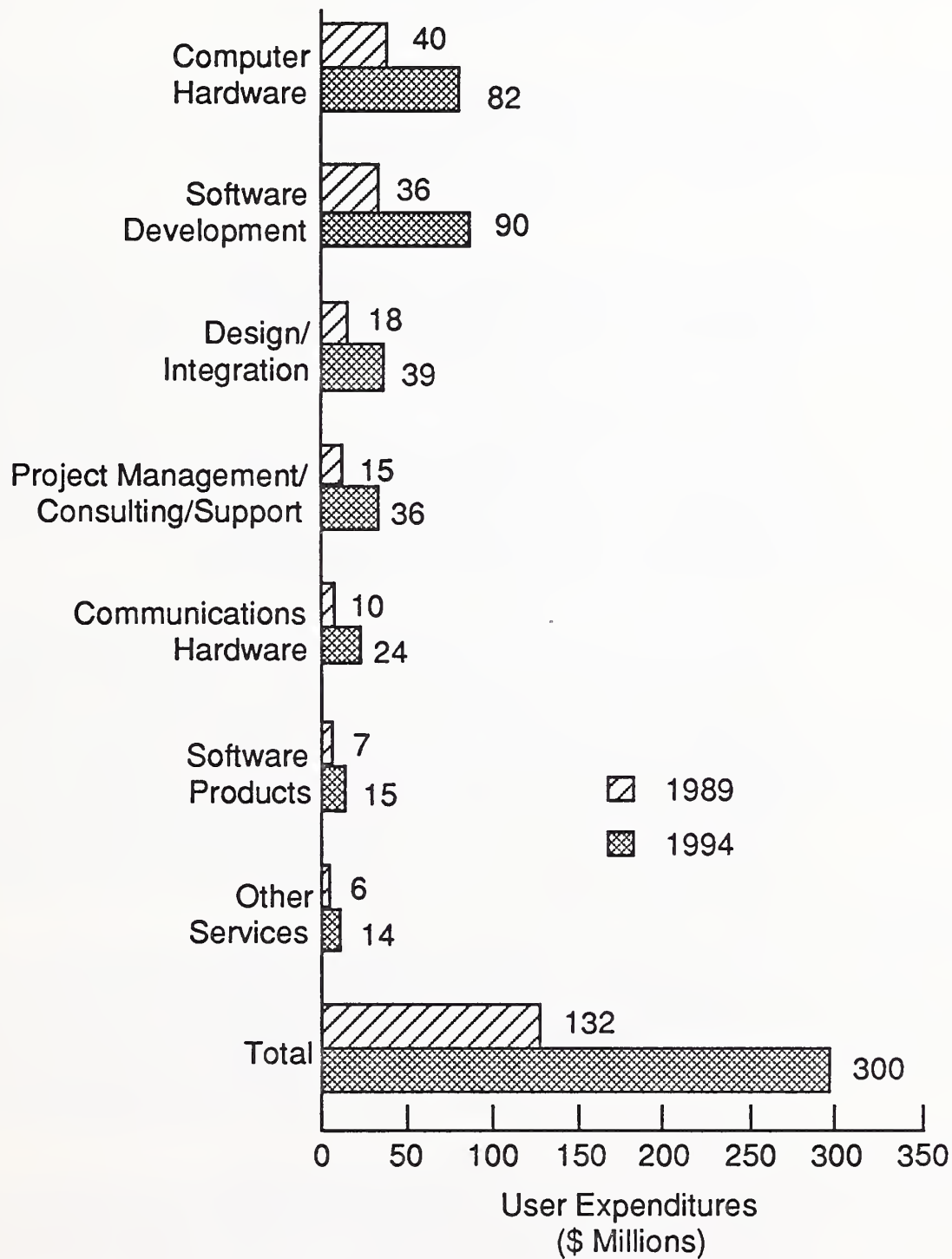
4. CSI Forecast

The wholesale distribution industry is expected to reach less than one-third of the level of retail. From a base of \$132 million in 1989, this sector will increase to \$300 million in 1994—for a CAGR of only 18%. Details are presented in Exhibit IV-26. This rate of growth is slightly less than half the retail growth rate.

Similar to the retail sector, software development is expected to be the most significant component, with a correspondingly smaller growth of software products resulting from the wide diversity of submarket needs. Although computer hardware will be the second largest CSI component, it reflects the industry's interest in employing newer but less expensive equipment.

The relatively low value of CSI projects thus far and the widespread nature of the industry provide for a market not dominated by any particular vendor. IBM provides most of the platforms and has managed a number of small projects. EDS has also ventured into this market. Smaller firms with some interesting assignments include Innovative Teletronics, Sentinal Computer Corporation, Systems Unlimited, and CRT Distribution Systems Inc.

EXHIBIT IV-26

Wholesale Distribution Industry Forecast, 1989-1994

N

Other Industries

The other industries sector includes agriculture, automotive rental, parking and repair, third-party maintenance, construction, hotel/motel and lodging, nonprofit membership organizations, and recreation and entertainment services.

1. Industry Forces

In each of the industries in this sector there are a few large, dominant firms that are capable of supporting large projects. The difficulty is finding these opportunities among the multitude of establishments included in this category.

Agriculture had a bad year in 1989 because of extensive droughts followed by heavy rains. Price increases in the distribution channels were substantial, however. Except for Holiday Inns, most hotels reported growth earlier in 1989, but continued growth is putting pressure on existing facilities. Several buyouts and mergers changed the competitive balance toward the end of the year. Restaurants showed about 8% growth in revenues, but with narrowed margins because of rising food and labor costs. Commercial fishing had only a slight net improvement as increasing insurance rates, higher wages and fuel costs, and longer runs to meet catch goals offset increased revenues.

The agricultural industry operates at several levels: large combine agribusinesses; small- to large-sized single farms that specialize in produce; and animal-based and related product businesses. Included with this industry are forestry and commercial fishing, hunting, and trapping businesses. Information applications have been extended from the large multisite agribusiness establishments down to PC-based local farm and animal husbandry installations. Applications include crop planning, feed and livestock records, financial and budget planning, and standard accounting functions.

Record keeping to track parts, customer charges, and orders—as well as an increased need for diagnostic systems in repair service and competition in auto rentals—characterize the automotive services market. In the hotel, motel, and lodging segment, overbuilding and a need to differentiate service have increased the importance of controlling the level of service and costs.

Nonprofit organizations are under increasing pressure to provide mailings, magazines, and other services to compete for and hold membership. Recreation/entertainment is characterized by a need to recruit and retain employees at low salaries and to economically manage, administer, and report on activities, events, services, and/or franchise operations. All of these activities have encouraged the use of computing for record keeping and accounting.

2. Impact on Information Systems and Services

The medium- to large-size agribusinesses and cooperatives use centralized IS to provide the usual range of computer-based services. New requirements include expanding PC networks and networks that connect to research institutions including government centers, county agencies, and distribution channels.

Connectivity and integration are also needs that must be considered in view of interlocked functions in the sector. Vendors must become familiar with these needs to successfully sell construction to companies, hotels, or automotive service companies.

End-user participation is a critical issue for IS managers. Where users are not running systems, their assistance is necessary to develop requirements and application systems. Education, training, and support must be supplied to help users meet this challenge—from a very limited budget in most cases.

The impact of technology that can be used in the business or that can make information systems more useful and economic is an issue for IS managers, who must be prepared for changes in this volatile sector. Lower-priced PCs, new types of storage technology, and more network capabilities can have a sizable impact on information system use.

3. CSI Potential

From a sector point of view, the number and size of CSI project opportunities are less attractive than those of other industries. However, there are projects of significance in these industries that should not be overlooked. Several positive factors are listed in Exhibit IV-27.

Agricultural investments are now provided by both domestic and foreign sources. Large crop facilities in cereals, basic foods, and high-value products require large networks between seed and fertilizer sources, large farm machinery maintenance organizations, transportation and distribution companies, and both domestic and foreign agriculture markets. A number of mergers and acquisitions have increased demand for CSI-type projects.

End-user participation will require more extensive preparation of training aids and support, frequently driven by geographical dispersion. But the users will need to be sold on the volume of integrated systems.

The services and cost control aspects of most of the submarkets—including auto rentals, auto maintenance, lodging, and recreation services—are the most critical for survival and growth and need to be emphasized.

EXHIBIT IV-27

Key Factors in Other Industries

- Positive
 - Network requirements
 - End-user participation
 - Service and cost control
 - Mergers and acquisitions
- Negative
 - Smaller project investments
 - Widely different submarkets
 - User training essential

Marketing costs could become prohibitive for CSI vendors, because the projects tend to be smaller and geographically separated. Different submarkets have unique problems which need to be addressed early. User training could become expensive if the clients are widely dispersed.

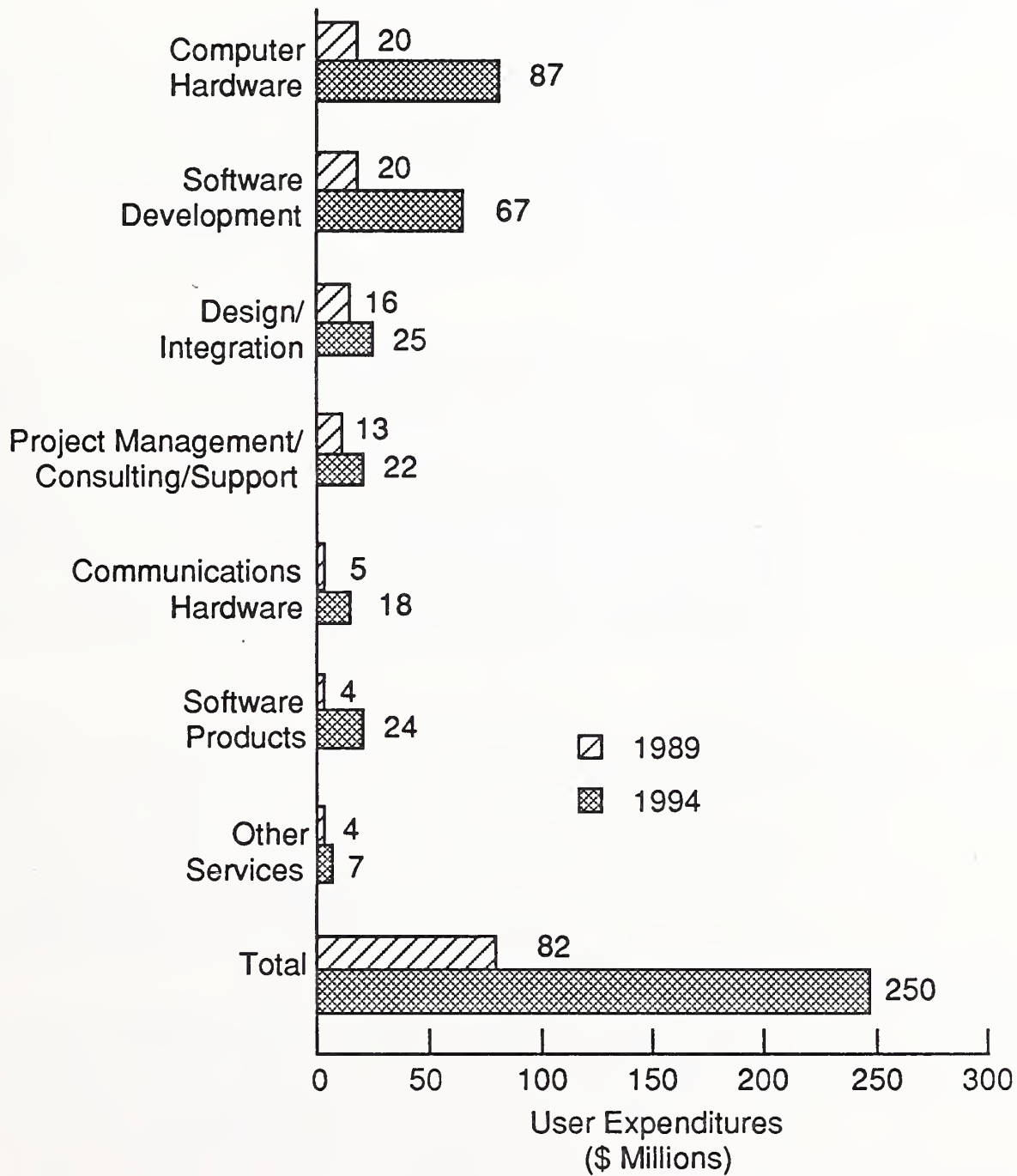
4. CSI Forecast

This sector previously had the smallest expenditure level of vertical industry sectors. New data increased the size of the CSI market from a base of about \$82 million in 1989 to about \$250 million in 1994—a CAGR of 25%. The hardware and custom software components will account for more than half of the expected expenditures. The growth rate of the current forecast is 3% higher than forecasted in 1988, when education was part of the industry sector, as seen in Exhibit IV-28.

IBM is the principal hardware vendor installing CSI in this market. AT&T, Hughes Comm, MA-COM, and New York Telephone have provided integrated networks. Specialists in this market also includes Booz Allen & Hamilton, TriSci, McDonnell Douglas, and Murdock Electronics. Competing for the CSI market are turnkey systems provided by VARs for the smaller organizations.

EXHIBIT IV-28

All Other Industries Forecast, 1989-1994



O

Federal Government

This sector includes defense and civil departments, independent agencies, and public corporations, but excludes weapons and platforms, and classified applications, such as embedded computer systems, intelligence, and tactical command and control systems.

1. Industry Forces

Although the federal government market continues to attract a widening range of potential suppliers, it is being buffeted by several factors. As the cold war appears to wind down, defense expenditures on weapons, platforms (tanks, planes, ships) and staff are being reduced. Yet, in view of the smaller staff, a number of systems integration projects now appear to be much more critical. Alternatively, system expenditures for civilian agencies are becoming important, to improve the delivery of services to the public.

Some anticipated system acquisitions appear to be at risk for reasons other than budget cuts. The widely discussed modernization of the income tax system may be accomplished piecemeal by the IRS. Several opportunities for vendor-furnished systems integration may be bypassed by vendor-furnished systems operation that solves both acquisition and declining staff problems. Systems operation projections have jumped from a CAGR of 8% in the 1986-1988 era to 15% in 1990 to 1994. Additionally, a freeze on research and development spending, including data processing systems, in GFY 1988, resulted in a drop of over \$1 billion in information technology expenditures in 1989-1994.

Congress passed legislature to establish a number of problem identification and procurement procedures, aimed at encouraging competition while acquiring an information system with realistic life-cycle costs. Inadequately trained procurement specialists, a shortage of qualified large-system program managers, and an almost continuous legislative oversight process has not assured acquisition of the most effective solution on time. Instead, a storm of protests about procurement procedures have delayed or cancelled a number of planned system acquisitions.

The federal government was the earliest sector to employ systems integration methodologies. Agencies usually advise industry of their intentions long before the solicitation documents are issued. The government uses very sophisticated tools to determine the relative adequacy of proposed systems solutions. Identifying and tracking opportunities in this sector is substantially easier than in the commercial and state and local government sectors, but the proposal and bidding process is complicated by socioeconomic regulations and drawn-out evaluations.

2. Impact on Information Systems and Services

Federal IS budgets aim toward greater functionality of the information resources. Most IS organizations are committed to maintaining quality support of their agencies, but continually face rising service-level and applications demands, obsolescence of a certain percentage of resources, and rising maintenance costs. A major share of existing software was custom-developed by contractors and in-house staffs to satisfy applications that have since been extensively modified.

Hardware and software maintenance impact the availability of IS staff to do new applications development and to staff internal systems integration projects. New demands for technical assistance to end users equipped with PCs or advanced workstations are also reducing staff availability for new projects.

Implementation of FTS-2000 and its competition with existing data networks is also increasing the workload of IS staffs. They have only recently acquired technical assistance for telecommunications design and planning to fill the void created by the AT&T deregulation orders.

New and upgraded or replacement system requirements are emphasizing improved service to end users, data integrity, relational data base systems, improved system security, and transparent connectivity. Departmental DP services are being decentralized, but extensively networked, to satisfy the demand for executive information systems and decision support systems.

New applications involve the use of AI in software development and situation modeling, standard financial/payroll/personnel systems, and EDI. PC acquisition and application continues at a much higher rate than earlier anticipated, further burdening the IS technical staff.

3. CSI Potential

The federal SI market is currently slightly smaller than the combined commercial market, as agencies press for more flexible and advanced resources to meet rising executive, legislative, and citizen service expectations. The expenditure rates are expected to decline in the 1990s but will continue at a positive level throughout the decade, as seen in Exhibit IV-29.

As indicated earlier, agencies are looking for integrated systems that will improve the productivity of both staffs and facilities, without significant operating budget increases. Existing personnel policies and the heavy software maintenance load cause continued shortages of in-house technical staffs. Implementation and initial operating support must come from commercial organizations to meet the service demands.

EXHIBIT IV-29

Key Factors in Federal Government Market

- Positive
 - Productivity improvements
 - Technical staff shortages
 - Shared implementation risks
 - Information technology upgrades
 - Service demand increases
- Negative
 - Deficit-limited budget
 - Greater protest activity
 - Existing systems maintenance
 - Slow standards implementation
 - Extended implementation schedules

Since there is always an element of uncertainty associated with the implementation of new information technology and higher capacity resources, the federal agencies have moved to a policy of sharing implementation risks with the successful vendor. Despite the risk of new service demands exceeding the capacity and capability of SI projects, federal procurement has moved to the increased use of fixed-price contracts.

User-based service demands continue to increase, steadily exceeding the ability of the in-house IS staff to satisfy the latest needs. In some cases, contractors are expected to provide full operational support of newly implemented SI projects for up to ten years after acceptance.

Several factors inhibit the FSI market. The two most significant are expected budget cuts to reduce or limit the federal deficit, and greater protest activity by disappointed bidders. Budget restrictions are forcing consolidation or outright cancellation of a number of agency-desired FSI projects. The increased protest activity is extending the procurement cycle, expending critical energies, and forcing agencies to more carefully review planned system acquisitions.

The cost of existing systems maintenance continues to rise rapidly, diverting support funds that are needed to acquire system upgrades and replacements.

Implementation of new information system standards that would both foster greater competition and substantially improve connectivity between systems has been dragging on. Vendors with competing operational approaches are not supportive of early standards and the civil agencies would like to take advantage of newer technologies with minimal restrictions.

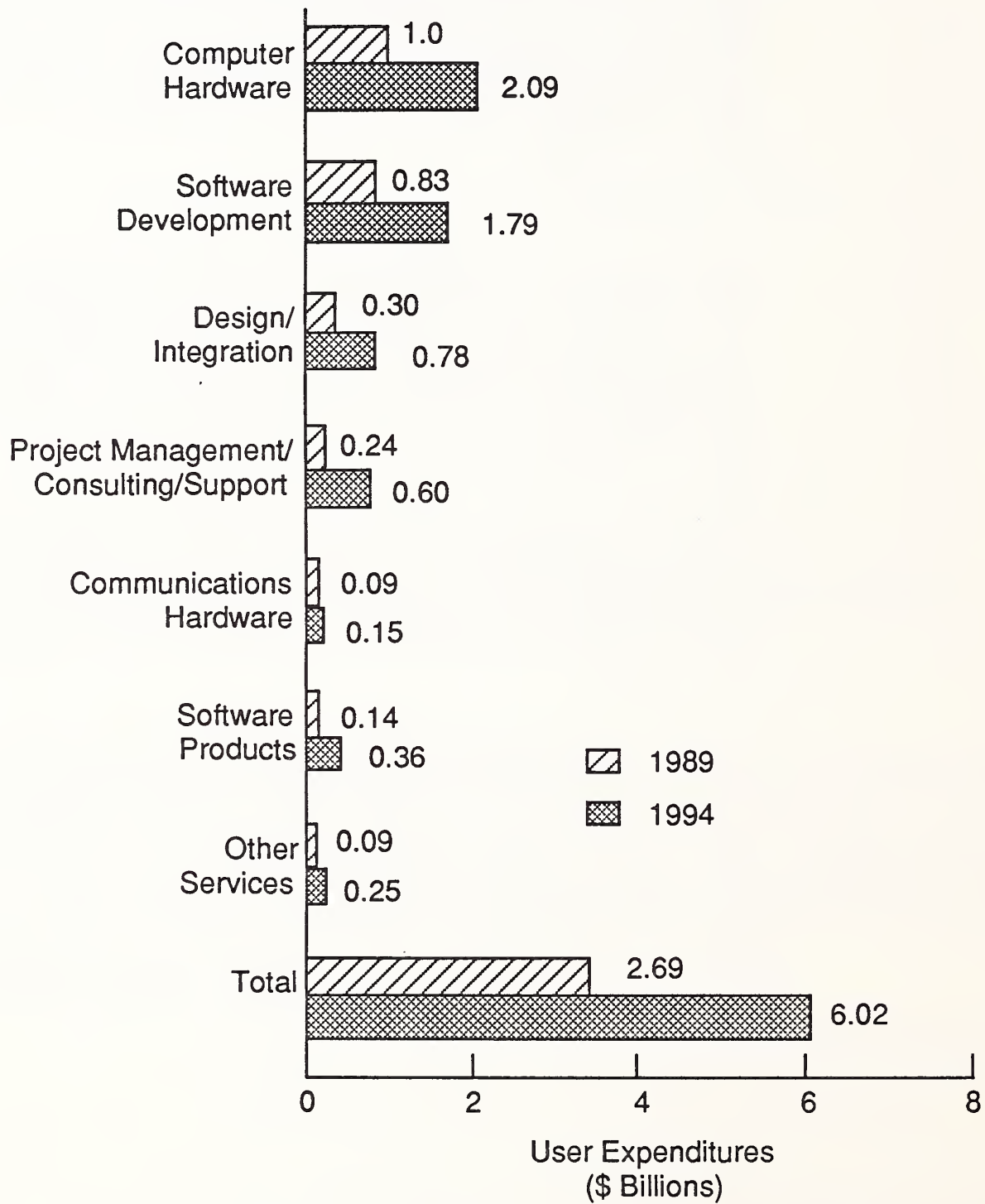
4. CSI Forecast

The federal government sector forecast for FSI shown in Exhibit IV-30 is expected to rise from a 1989 base of \$2.7 billion to \$6.0 billion by 1994—a CAGR of 17%. The hardware and custom software development components will increase rapidly. Software product acquisition is continuing to rise under prodding by GAO and GSA, but there are sufficiently unique applications in the government to justify, in their view, the high rate of custom software development.

Although the base amount for 1988 was substantially higher than that reported in the 1986 forecast, the 1989 expenditures were \$200 million less than forecasted in 1988. Cancellation of several defense projects and delay, if not outright cancellation, of the Tax System Redesign project, dropped the forecast for 1994 from its earlier \$6.9 billion to slightly more than \$6 billion.

The continued growth of FSI attracts an increasing number of systems integration vendors. Among the hardware vendors are IBM, Digital, Unisys, Harris, Hewlett-Packard and Tandem. BCS, BDM/Ford Aerospace, GDS, MM, and Rockwell are key aerospace firms visible in the market. Hardware-independent system firms include: AMS, CSC, CDSI, EDS, GE, Black and Decker (PRC&ATI), SAIC, Sterling Software, Tisoft and TRW. The Big Six are represented by Anderson Consulting, Coopers and Lybrand, and Price Waterhouse. Communications firms are ably represented by AT&T, Bell Atlantic, Contel, Northern Telecom, and Telenet.

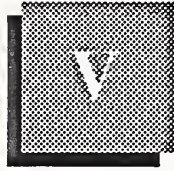
EXHIBIT IV-30

Federal Government Forecast, 1989-1994



Market Strategies and Recommendations





Market Strategies and Recommendations

The attractions of the systems integration market can obscure the very real risks that vendors face when transacting business in this market—the risks to the company's finances and reputation when systems integration projects fail. Regardless of the reason(s) for failure and the source of the fault, the integrator must bear the brunt of the repercussions. The considerable investment and importance of these projects to the client organizations—and the publicity such projects receive—make it unlikely that failure will be overlooked by investors, potential clients, and the competition.

The steps to success as a systems integrator require the creation and imposition of careful marketing, opportunity qualification, disciplined bid preparation, and established program management practices. Diligent competitor evaluation, continuous presale development, and creation of a committed team in-house and with partner/alliances are essential to achieve the rewards of completed systems integration projects. Vendors must also diligently assess, manage, and contain the inherent risks. These activities are not one-time, but rather entail constant monitoring of the system integration plan and its execution.

A

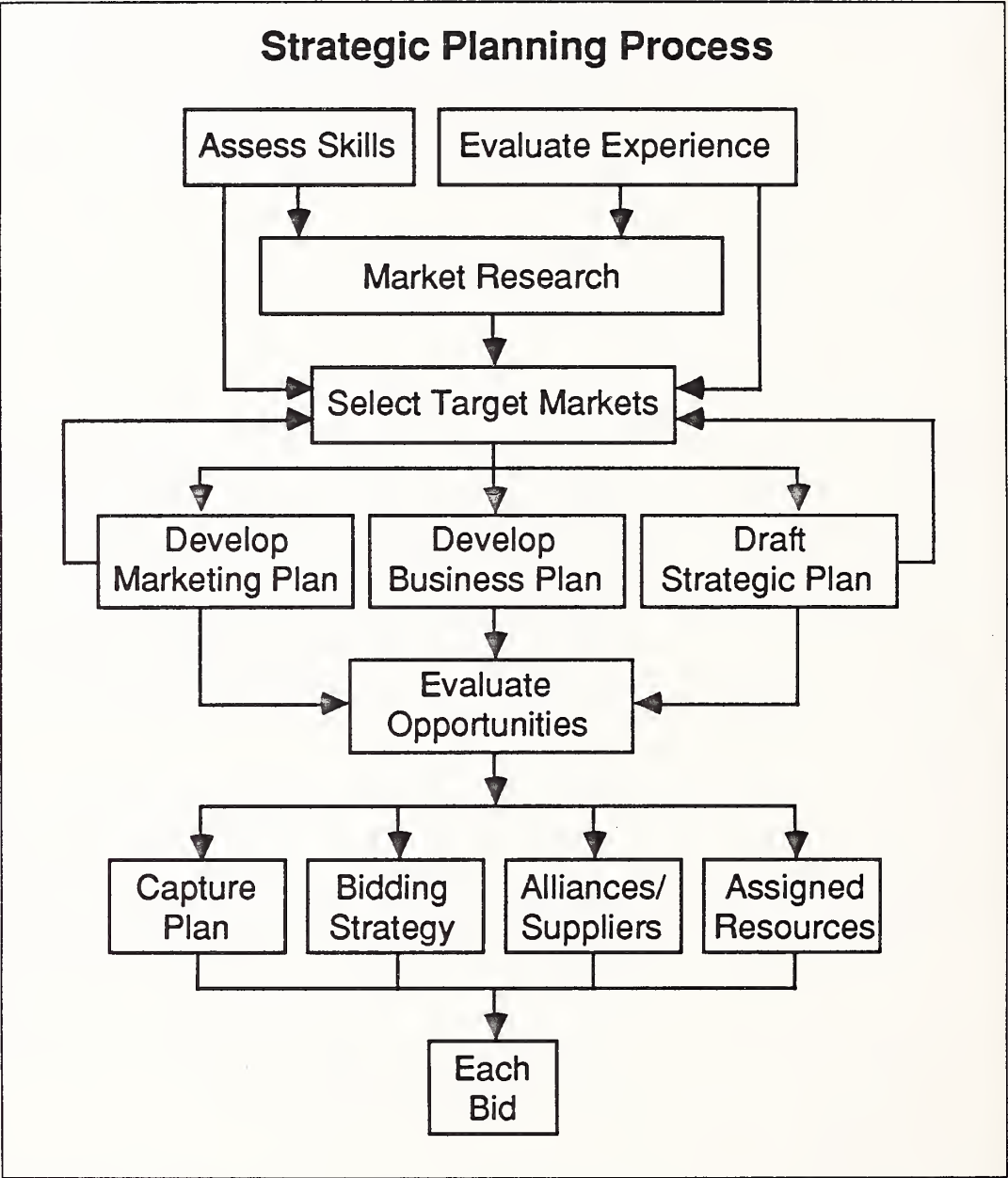
Market and Opportunity Identification

The leading SI vendors do not publicly divulge their strategies, their target opportunities, or many of their internal bidding procedures. Nor do they explain the tactical plans and final winning steps as they pick off highly desirable commercial and federal contracts.

Elements of the processes SI vendors employ eventually become apparent, through postaward announcements, market analysis, press coverage, professional lectures, and competitor comments. The process outlined in Exhibit V-1 is an amalgamation of the same methodology used in other highly competitive businesses. The key step, however, is development of strategic plans and selection of strategic goals *after* careful assessment of internal resources and comparison with the requirements of desirable

markets—industry-specific, cross-industry, or some suitable combination.

EXHIBIT V-1



An important aspect of the process is that it is continuing, with results of later steps fed back for fine tuning and course corrections when needed. Less time is consumed in selecting the markets if the in-house resource assessment is done first.

A market or submarket should be selected that demonstrates the prospects for a series of bids that can leverage on earlier efforts. At first, the selection should be fairly narrow, with one or two alternates that could be followed if the prime selection doesn't produce contracts.

Several midsize competitors took stock of their diversification efforts in 1988 and 1989 and elected to close departments and divisions that were unsuccessful in marketing. Most competitors admitted that resources were diffused by too many parallel demands and too few real opportunities.

Opportunities that do not fit within the limits of the (tactical) business plan or do not focus on the longer-term strategic goal(s) must be declined before any serious resource commitments take place.

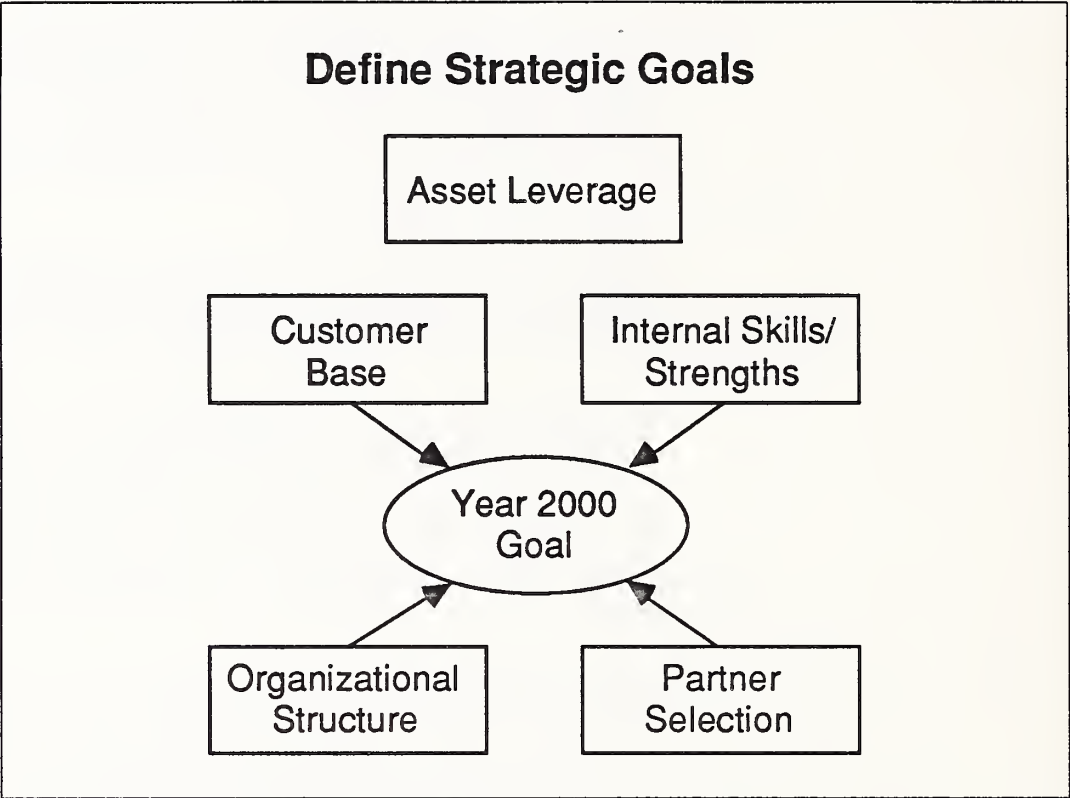
The capture plan must consider the client's stated and presumed objectives, the probable strategy of the leading competitor(s), and the presale activities to improve image and select partners/allies. The bidding strategy must consider resource commitment, proposal development, key selling points, real cost and potential cost exposures, and the negotiable price range.

Reference should be made to Section III, Market Analysis and Forecast, and Section IV, Vertical Industry Markets for Systems Integration, for preliminary guidance on market growth potential, key opportunity areas, and industry-unique hurdles.

Early in the process, the SI vendor/candidate needs to define the company's strategic goal(s). The goals need to be realistic, clearly and definitively stated in writing, and communicated to the whole organization. Painstaking care should be taken to avoid frequent restatement, which can lead to confusion. The key elements are identified in Exhibit V-2.

Partner selection and alliances will be discussed later, but an accurate assessment must first be made of internal skills, strengths, and weaknesses—as mapped against the needs to be met to attain the long-range goal. The level of retention of the existing customer base will determine what and how many external resources will be needed to reach the goal.

EXHIBIT V-2

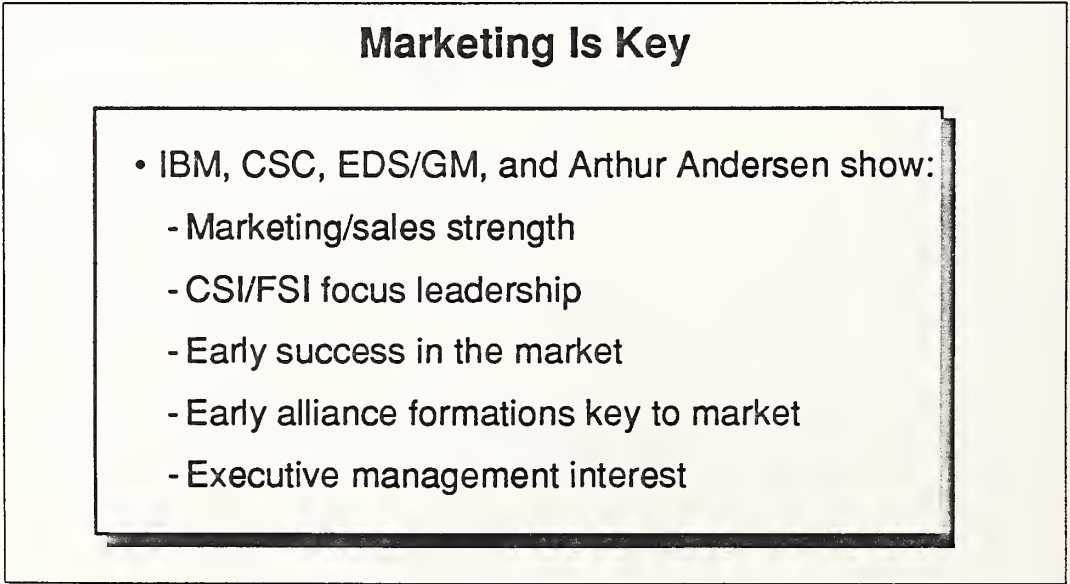


B

Marketing and Sales

In the early stages of the SI market development, the degree to which vendors are able to leverage their marketing strengths to focus on the target markets will determine who obtains the early lead —see Exhibit V-3. Although IBM, EDS/G, CSC, and Arthur Andersen all have corporate policies limiting them from disclosing details of their businesses, it is their practice (and that of every vendor) to leverage early contract successes to give them a high degree of visibility.

EXHIBIT V-3



Market positioning—or the ability to occupy a specific place and fulfill a specific role in the market—is not only dependent on a vendor's natural skill base but is also, at this stage of the market, a question of posturing or seizing the high ground in a given market area and holding it.

Technical positioning is a different matter altogether, as outlined in Exhibit V-4. Here a vendor must compare its abilities with respect to the target market(s) in terms of industry processes (e.g., shop floor operations in manufacturing) and typical hardware and systems software environments found (e.g., DEC/VMS, IBM/VM/MVS) in addition to the application requirements of the individual companies.

The vendor must also carefully evaluate the strengths and weakness of the competition and their probable ranking in terms of likelihood to be awarded the contract. Unless a vendor is sure to be considered at least in the top three competitors, he would be well advised to “walk away,” before investing precious money in a “can't win” situation.

EXHIBIT V-4

Market Analysis

- Examine target market potential
 - Ability to fund
 - State of user sophistication
 - Number of SI projects in next five years
- Vendor image in market
- Competitor market penetration

It is essential that an appraisal be made of the company's knowledge of the industry processes found in the target market, particularly vertical market processes that will be the foundation of the vendor's ability to counsel users on CSI implementations. Although it is possible to participate in systems integration projects that do no more than update the technical solutions to a process that has already been automated, the future would seem to belong to vendors that are able to innovate at the industry process level.

The presales effort should also be carefully planned to maximize use of early marketing information and to contribute effectively to the vendor's overall understanding of the market, the opportunities, and the key prospective clients. Sales people need to begin identification of the key players in the client decision chain and to develop a sense of the average project values awarded in the market.

C

Bid/Proposal Preparation

The bid/proposal preparation process begins with some indication that a prospective client intends to award a contract for implementation of a system. In the federal market the intention can be included in a briefing to industry or notice of "Sources Sought" in the CBD (Commerce Business Daily—published by the Commerce Department). Most commercial market leads begin with an informal inquiry, but some advertise intention of issuing a letter of solicitation.

In all but a few special areas, governments use well-defined SI functional or system performance specifications and frequently ask for industry comments on the proposed procurement. The procurement process is not as well structured in the current commercial SI sector, and often does not include a formal request for proposal (RFP), project specifications, and stated bid evaluation criteria.

At the very least, vendors should develop a detailed checklist of generic tasks associated with the SI project. This checklist can be used in early conversations with the client to discuss what the project entails and whether the integrator or the IS staff is to take responsibility for each individual task.

A strategic decision needs to be made by the CSI bidder in the absence of formal statements—to establish the congruence between what the client wants, needs, and is willing to pay for. To avoid potential pitfalls, CSI vendors may prefer to propose feasibility studies as a first step in a major project. This early participation in a consultancy role has the additional advantage of establishing a level of comfort between contractor and client that may pay off in managing the project and the client later.

Considering the performance of the tasks outlined in Exhibit V-5, the investment required of vendors in developing a bid is substantial, perhaps involving 5-6% of the contract value. Significant amounts of time and money must be spent in understanding the functional requirements, technical specifications, time and financial constraints, business terms and conditions, other salient factors (internal politics, key decision-makers, buyer perceptions), and the selection process and evaluation criteria to be used in the process.

EXHIBIT V-5

Bid Development and Investment

- Requirements analysis
 - Wants versus needs
 - Functional solution
 - Feasibility
- Proposal basis
 - System architecture
 - Equipment and software
 - Delivery requirements
 - Acceptance criteria
- Staffing
 - Project management
 - In-house staff
 - Outside skill needs
- Environment
 - Installation
 - Training
- Costing
 - Labor
 - Materials
 - Markup
- Competitive analysis
- Competitive pricing

Once these specifics are uncovered and understood, additional time and money must be expended on developing the bid. An assessment of in-house capabilities must be made with respect to the requirements. What does the bidder bring to the project? One must conduct an internal skills inventory and a determination of what skills need to be acquired.

One should develop partners and alliances in as early a stage in the bidding process as possible, even before the formal process begins. Strong alliances can help to construct a winning bid by highlighting experiences and discussing features beneficial to the client. The field sales and middle management personnel of allies and subcontractors can function as additional intelligence gatherers about the competition.

There is and should be a sense of uneasiness about alliances by many SI vendors, that would prefer arms-length subcontract relations with suppliers. There have been several excellent publications on this subject from the business graduate schools of MIT, Harvard, and UCLA. The essence of the UCLA study is noted briefly in Exhibit V-6 and also discussed in Section III.

EXHIBIT V-6

Problems of Vendor Alliances

- **Problems**
 - Impact of environmental forces
 - Short-term differences in performance
 - Perceived versus actual benefits
 - Unwillingness to share key assets
 - Differences in business culture
- **Steps to minimize failures**
 - Clearly determine common objectives
 - Communicate strategy to operating people
 - Avoid complexity
 - Insulate alliances from partners

The problems that contribute to the failure of alliances can occur quickly if adequate planning and execution of the agreement do not occur. Benefits and key asset sharing are quoted most frequently. Differences in business culture may take some time to become fatal.

The avoidance steps can prevent the type of distrust that fails to make the alliance a winning combination. Clearly written objectives in the hands of key managers and open communication appear to be the most effective tools. But alliances are rarely intended to last long.

Some potential projects will be so technically advanced as to invite the question, "Can it be done?" For these projects an investment in engineering a prototype may be required. If the prototyping requirement is expensive, the buyer may be willing to underwrite the cost, unless the buyer believes the prototype could be used by others.

The significant investment for the bidder comes in competitive analysis. Much more than listing the strengths and weaknesses of the competition, this assessment requires the development of an "as if" bid. In this method the bidder's staff actually develops the bid that they think the competitor might submit. The bidder's actual bid must beat this "straw-man" bid in the internal review before being submitted to the buyer. When the size of the award dictates, the internal effort applied to the development of these two bids can result in a very strong and, one hopes, winning bid.

D

Project and User Management

Project management requirements have been emphasized throughout this report and will not be elaborated further here. Skill in these associated tasks is critical to managing/containing risks, and vendors need to have deep understanding of theory and techniques, and strong supportive tools.

One aspect of project management frequently overlooked by contractors is the need to vest contract authority in the project manager. In time-critical projects, layered management can impede the schedule and add unnecessary risks. The results of assigning responsibility to a single manager who can act quickly far outweigh the risks of project delays and cost overruns.

Another aspect of management frequently neglected in SI-type projects is the need to manage the user. The contractor does not want to be second-guessed on every decision. The user must be kept informed of impending decisions, and when decisions are made, the user must be informed of the decision and convinced that the decision was the alternative that best met the user's interests.

A formal "change management" system is also recommended. User requests for changes to specifications and vendor approvals should be in writing and include projected impact on project schedule and cost.

User management also entails avoiding surprises. Formal and informal status reports must be made to various levels of the client organization on a timely basis, to assure ultimate acceptance.

E**Risk Containment**

In federal projects, government regulations guide the extent to which the agency client shares the performance and cost risk with the SI vendor. In the commercial sector, the primary responsibility is assigned to the CSI prime contractor. This assignment does not mean that the contractor must take sole responsibility; it is possible, legally, to share the risks with partners, allies, and third-party suppliers. The subcontracts must contain the provisions, and the suppliers need to be made a part of the overall project team. Keys to managing risk containment are listed in Exhibit V-7.

EXHIBIT V-7**Manage Risk Containment**

- Risk varies with project size, complexity, client sensitivity
- Risk shared with subcontractors
- Sensitize all levels of company to risk management
- Liability insurance coverage
- Risk-level assessed during bid preparation

It is essential that all levels of the vendor's organization be made aware and sensitive to the needs and procedures of risk management. Areas of potential risk should be identified during the bid preparation phase and the probable extent of exposure estimated.

It also seems prudent for CSI vendors to provide for potential legal and financial liabilities by assessing liability insurance coverage and making the necessary changes to cover the unique risks of CSI, including third-party failures and dissatisfaction of the client on delivery.

F**Bid Selection and
User Purchase Criteria**

Beyond technical content, the SI vendor's bid must also reflect congruence between the buyer's perception of his own strengths and weaknesses, and the capabilities of the bidder. The bid should leave the buyer with the feeling that the bidder recognizes the client's capabilities and has plans for covering the weaknesses.

Individual client organizations differ with respect to the extent that the vendor analysis of strengths and weaknesses impacts the valuation given the bidder. The impact potential is largely influenced by the client's IS staff's knowledge of the industry and the applications.

Unless the bid solicitation dictates otherwise, the bid should exclude services that the vendor might like to provide but would have a low priority—multivendor maintenance, maintenance of a network, and maintenance of the total system are just three examples.

The type of contract proposed by the bidder makes a strong statement of the bidder's concern about the risks involved and the bidder's confidence in managing and containing this risk. A fixed-price contract with performance guarantees and even strong penalty clauses tells the buyer of the bidder's confidence in successfully completing the project to the buyer's satisfaction.

Fixed-price contracts with performance guarantees are currently much more acceptable to clients than other types of business terms, including fixed-price without guarantees. The performance guarantee requirement is a risk trade-off from the client's perspective. With diminished control over the developing system, users seek maximum assurance through guarantees. In many situations this guarantee becomes mandatory.

Another area of risk to the vendor is the terms and conditions of acceptance criteria. A separate INPUT report, *Buyer Issues*, noted that formal acceptance procedures were not included in 70 percent of the bid solicitations. The vendors interviewed said that demonstration and acceptance can either be proposed in the bid or must become part of the final contract negotiation. Provision of the procedure in the bid could help the user feel more confident about the bidding vendor.

The *Buyer Issues* report also provided additional guidance to CSI vendors on bidding times, management involvement, user involvement, training, and procurement methods. This guidance is too voluminous to include here.

G

Recommendations

Suggestions for getting started or improving probabilities of success have been included in Section III and throughout this section. The key points that have been made are listed in Exhibit V-8.

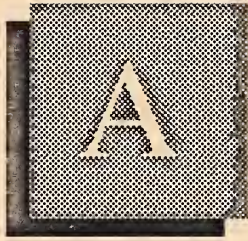
- Select markets and target projects that are, or can become, a natural fit for the company's skills, experience, and resources. Bring in allies or subcontractors to fill the voids.
- Advertise company expertise in key industries and applications to build an image with potential clients and attract valuable third-party assistance.

EXHIBIT V-8

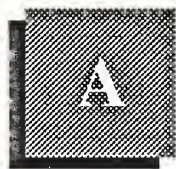
Recommendations

- Select targets and markets carefully
- Advertise expertise in application areas
- Demonstrate knowledge of technology
- Establish strong alliances
- Employ risk management policies
- Demonstrate risk acceptance
- Procedurize bid preparation
- Demonstrate project management skills

- Demonstrate expertise in current and new technology that has direct applicability to the targeted industry markets.
- Establish strong alliances that can help overpower the competition—but make the alliance part of the company team, to offer a united front to the client.
- Employ risk management assessment and containment policies and advertise the availability of these skills in the company.
- Demonstrate risk acceptance by offering fixed-price bids with performance guarantees and penalty clauses to give the buyer confidence in completing the project.
- Use disciplined bid preparation procedures with administrative control, document handling, and cost-accounting techniques.
- Demonstrate project management (and user management) skills with formal policies and vested authority to control the project and interface client management directly.



Appendix: Definitions



Appendix: Definitions

Appendix A contains the definitions used by INPUT to describe the Information Services Industry.

Information Services - Computer-related services involving one or more of the following:

- Processing of computer-based applications using vendor computers (called “processing services”)
- Network-oriented services or functions such as value-added networks, electronic mail, electronic document interchange, on-line data bases, news data bases, videotex
- Products and services that assist users in performing functions on their own computers or vendor computers (called “software products” or “professional services”)
- Services that utilize a combination of hardware and software, integrated into a total system (called “turnkey systems” and/or “systems integration”)

All user expenditures reported are “available” (i.e., noncaptive, as defined below).

A

User Expenditures

Noncaptive Information Services User Expenditures - Expenditures paid for information services provided by a vendor that is not part of the same parent corporation as the user

Captive Information Services User Expenditures—Expenditures received from users who are part of the same parent corporation as the vendor.

B

Delivery Modes

The structure of the information services industry as defined by INPUT in 1989 is illustrated in Exhibit A-1.

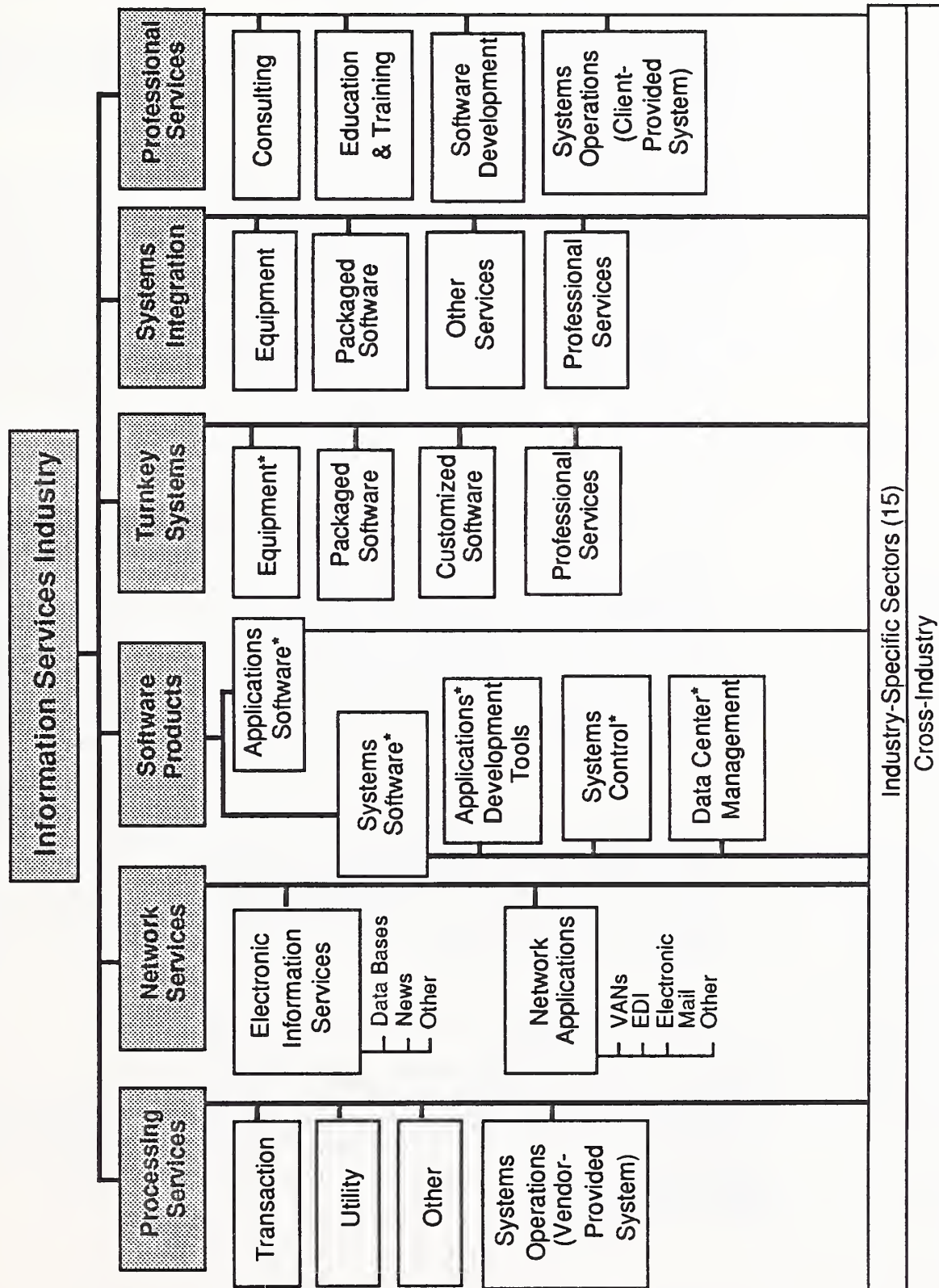
1. Processing Services

This category includes transaction processing, utility processing, other processing services, and systems operations.

- *Transaction Processing Services* - Updates client-owned data files by entry of specific business activity, such as sales order, inventory receipt, cash disbursement, etc. Transactions may be entered in one of four modes:
 - *Interactive* - Characterized by the interaction of the user with the system, primarily for problem-solving timesharing, but also for data entry and transaction processing; the user is on-line to the program/files. Computer response is usually measured in seconds or fractions of a second.
 - *Remote Batch* - Where the user hands over control of a job to the vendor's computer, which schedules job execution according to priorities and resource requirements. Computer response is measured in minutes or hours.
 - *User Site Hardware Services (USHS)* - Those offerings provided by processing services vendors that place programmable hardware at the user's site rather than at the vendor's data center. Some vendors in the federal government market provide this service under the label of distributed data services. USHS offers:
 - ° Access to a communications network
 - ° Access through the network to the RCS vendor's larger computers
 - ° Local management and storage of a data base subset that will service local terminal users via the connection of a data base processor to the network
 - ° Significant software as part of the service
 - *Carry-in Batch* - Where users deliver work to a processing services vendor

EXHIBIT A-1

Information Services Industry Structure—1989



Source: INPUT

*Broken out by Workstation/PC, Minicomputer, and Mainframe segments
 Note: totals may not add due to rounding.

MFOR-3/90:1

- *Utility Processing* - Vendor provides access to basic software tools, enabling the users to develop their own problem solutions such as language compilers, assemblers, DBMSs, sorts, scientific library routines, and other systems software.
- *"Other" Processing Services* - Include computer output microfilm, other data output services, data entry services, disaster recovery and backup services.
- *Systems Operations (Processing)* - Also referred to as "resource management," facilities management, or "COCO" (contractor-owned, contractor-operated). Systems control is the management of all or part of a user's data processing functions under a long-term contract of not less than one year. This would include remote computing and batch services. To qualify, the contractor must directly plan, control, operate, and own the facility provided to the user—either on-site, through communications lines, or in a mixed mode.

Processing services are further differentiated as follows:

- *Cross-industry* services involve the processing of applications that are targeted to specific user departments (e.g., finance, personnel, sales) but that cut across industry lines. Most general-ledger, accounts receivable, payroll, and personnel applications fall into this category. General-purpose tools such as financial planning systems, linear regression packages, and other statistical routines are also included. However, when the application, tool, or data base is designed for specific industry use, then the service is industry-specific (see below).
- *Industry-specific* services provide processing for particular functions or problems unique to an industry or industry group. Specialty applications can be either business or scientific in orientation. Examples of industry-specialty applications are seismic data processing, numerically controlled machine tool software development, and demand deposit accounting.

2. Network Services

Network services include a wide variety of network-based functions and operations. Their common thread is that none of these functions could be performed without network involvement. Network services is divided into two major segments: network applications and electronic information systems.

a. Network Applications

The network applications segment is composed of three subsets:

- *Value-Added Networks (VANs)* - VANs typically involve common carrier network transmission facilities that are augmented with computerized switches. These networks have become associated with packet-switching technology because the public VANs that have received the most attention (e.g., Telenet and TYMNET) employ packet-switching techniques. However, other added data service features, such as store-and-forward message switching, terminal interfacing, error detection and correction, and host computer interfacing, are of equal importance.
- *Electronic Data Interchange (EDI)* - EDI is the application-to-application electronic communications between organizations, based on established business document standards.
- *Electronic Mail (E-Mail)* - Transmission of messages across an electronic mail network managed by a services vendor.

b. Electronic Information Services

Electronic information services are data bases that provide specific terminal-based inquiry such as stock prices, legal precedents, economic indicators, medical diagnosis, airline schedules, current news stories, automobile valuations, etc. Users typically inquire into and extract information from these data bases but do not update them.

3. Software Products

This category includes user purchases of applications and systems software packages for in-house computer systems. Included are lease and purchase expenditures, as well as expenditures for work performed by the vendor to implement or maintain the package at the user's sites.

Expenditures for work performed by organizations other than the package vendor are counted in the category of professional services. Fees for work related to education, consulting, and/or custom modification of software products are counted as professional services, provided such fees are charged separately from the price of the software product itself.

There are several subcategories of software products, as indicated below.

a. Applications Software Products

Applications software products perform functions directly related to solving users' business or organizational needs. The products can be:

- *Cross-Industry Products* - Used in multiple-industry applications as well as the federal government sector. Examples are payroll, inventory control, and financial planning.
- *Industry-Specific Products* - Used only in a specific industry sector, such as banking and finance, transportation, or discrete manufacturing. Examples are demand deposit accounting, airline scheduling, material resource planning, and insurance claim management.

b. Systems Software Products

Systems software products enable the computer/communications system to perform basic machine-oriented or user interface functions. These products include:

- *System Control Products* - Function during applications program execution to manage the computer system's resources. Examples include operating systems, communication monitors, emulators, spoolers, network control, library control, windowing, access control.
- *Data Center Management Products* - Used by operations personnel to manage the computer system's resources and personnel more effectively. Examples include performance measurement, job accounting, computer operations scheduling, utilities, capacity management.
- *Applications Development Products* - Used to prepare applications for execution by assisting in designing, programming, testing, and related functions. Examples include traditional programming languages, 4GLs, sorts, productivity aids, assemblers, compilers, data dictionaries, data base management systems, report writers, project control and CASE systems.

4. Turnkey Systems

A turnkey system is an integration of systems and applications software with CPU hardware and peripherals, packaged as a single application (or set of applications) solution. The value added by the vendor is primarily in the software and support. Most CAD/CAM systems and many small-business systems are turnkey systems. This does not include specialized hardware systems such as word processors, cash registers, or process control systems, nor does it include Embedded Computer Resources for military applications. Turnkey systems may be either custom or packaged systems.

- Hardware vendors that combine software with their own general-purpose hardware are not classified by INPUT as turnkey vendors. Their software revenues are included in the appropriate software category.

- Turnkey systems revenue is divided into two categories.
 - *Industry-Specific Systems* - Systems that serve a specific function for a given industry sector, such as automobile dealer parts inventory, medical record keeping, or discrete manufacturing control systems
 - *Cross-Industry Systems* - Systems that provide a specific function that is applicable to a wide range of industry sectors, such as financial planning systems, payroll systems, or personnel management systems
- Revenue includes hardware, software, and support functions.

5. Systems Integration (SI)

Systems integration is a business offering that provides a complete solution to a complex information system, networking, or automation requirement through the custom selection and implementation of a variety of products and services.

A system integrator is a business organization responsible for overall management of a systems integration contract and is the single point of contact and responsibility to the buyer for delivery of the specified system function and performance on schedule and at the contracted price.

The systems integrator will perform, or manage others who perform, most or all of the following functions:

- Program management, including subcontractor management
- Needs analysis
- Specification development
- Conceptual and detailed system design/architecture
- System component selection, modification integration, and customization
- Custom software design and development
- Custom hardware design and development
- System implementation, cutover, test, and evaluation
- Life cycle support, including:
 - System documentation and user training
 - System operation and/or management
 - System maintenance
- Financing

6. Professional Services

This category includes consulting, education and training, software development, and systems operations as defined below.

- *Software Development* - Development of a software system on a custom basis. It includes one or more of the following: user requirements definition, system design, contract programming, documentation.
- *Education and Training* - Products and/or services related to information systems and services for the user, including computer-aided instruction (CAI), computer-based education (CBE), and vendor instruction of user personnel in operations, programming, and maintenance.
- *Consulting Services* - Information systems and/or services management consulting, project assistance (technical and/or management), feasibility analyses, and cost-effectiveness trade-off studies.
- *Systems Operations (Professional Services)* - This is a counterpart to systems operations (processing services), except the computing equipment is owned or leased by the client, not by the vendor. The vendor provides the staff to operate, maintain, and manage the client's facility.

C

Equipment/Computer Systems

1. Equipment

Equipment includes all computer and telecommunications equipment that can be separately acquired with or without installation by the vendor and not acquired as part of an integrated system.

- *Peripherals* - Includes all input, output, communications, and storage devices (other than main memory) that can be connected locally to the main processor and generally cannot be included in other categories such as terminals
- *Input Devices* - Includes keyboards, numeric pads, card readers, light pens and track balls, tape readers, position and motion sensors, and analog-to-digital converters
- *Output Devices* - Includes printers, CRTs, projection television screens, micrographics processors, digital graphics, and plotters
- *Communication Devices* - Includes modems, encryption equipment, special interfaces, and error control
- *Storage Devices* - Includes magnetic tape (reel, cartridge, and cassette), floppy and hard disks, solid state (integrated circuits), and bubble and optical memories

- *Terminals* - Three types of terminals are described below:
 - *User-Programmable* - Also called intelligent terminals, including:
 - Single-station or standalone
 - Multistation shared processor
 - Teleprinter
 - Remote batch
 - *User Nonprogrammable*
 - Single-station
 - Multistation shared processor
 - Teleprinter
 - *Limited Function* - Originally developed for specific needs, such as point-of-sale (POS), inventory data collection, controlled access, and other applications.

2. Computer Systems

Computer systems include all processors from microcomputers to supercomputers. Computer systems may require type- or model-unique operating software to be functional, but this category excludes applications software and peripheral devices.

- *Microcomputer (Price below \$15,000)* - Combines all of the CPU, memory, and peripheral functions of an 8- or 16-bit computer on a chip in the form of:
 - Integrated circuit package
 - Plug-in board with more memory and peripheral circuits
 - Console including keyboard and interfacing connectors
 - Personal computer with at least one external storage device directly addressable by the CPU
- *Workstation (Price between \$10,000 and \$100,000)* - An integrated multifunctional workstation capable of routine higher-speed communications with mini and mainframe computers and of performing complex local processing. While similar to microcomputers, the workstation typically will have 16- or 32-bit architectures, plus greater graphics and integrated communications capabilities.
- *Minicomputer (Price between \$15,000 and \$350,000)* - Usually a 16- or 32-bit computer. May represent a portion of a larger system or a complete standalone system by itself.

- Personal business computer
- Small laboratory computer
- Nodal computer in a distributed data network, remote data collection network, or connected network, or connected to remote microcomputers
- *Mainframe (Price above \$350,000)* - Typically a 32- or 64-bit computer with extensive applications software and a number of peripherals in standalone or multiple-CPU configurations for business (administrative, personnel, and logistics) applications; also called a general-purpose computer.
- *Supercomputer* - High-powered processors with numerical processing throughout that is significantly greater than the fastest general-purpose computers, with capacities in the vicinity of 10-50 million floating point operations per second (MFLOPS). Supercomputers fit in one of two categories:
 - *Real Time* - Generally used for signal processing in military applications.
 - *Non-Real Time* - For scientific use in one of three configurations:
 - Parallel processors
 - Pipeline processor
 - Vector processor
- *Embedded Computer* - Dedicated computer system designed and implemented as an integral part of a weapon, weapon system, or platform; critical to a military or intelligence mission such as command and control, cryptological activities, or intelligence activities. Characterized by military specifications (MIL SPEC) appearance and operation, limited but reprogrammable applications software, and permanent or semipermanent interfaces. May vary in capacity from microcomputers to parallel processor computer systems.

D

Telecommunications

1. Networks

Networks are the electronic interconnections between sites or locations that may incorporate links between central computer sites and remote locations and switching and/or regional data processing nodes. Network services typically are provided on a leased basis by a vendor to move data, voice, video, or textual information between locations. Networks can be categorized in several different ways.

- *Common Carrier Network* - A public access network, such as provided by AT&T, consisting of conventional voice-grade circuits and regular switching facilities accessed through dial-up calling with leased or user-owned modems for transfer rates between 150 and 1200 baud
- *Value-Added Network (VAN)* - (See listing under Section B.2, Delivery Modes.)
- *Local Area Network (LAN)* - Limited-access network between computing resources in a relatively small (but not necessarily contiguous) area, such as a building, complex of buildings, or buildings distributed within a metropolitan area. Uses one of two signaling methods.
 - *Baseband* - Signaling using digital waveforms on a single frequency band, usually at voice frequencies and bandwidth, and limited to a single sender at any given moment. When used for local-area networks, typically implemented with TDM to permit multiple access.
 - *Broadband* - Transmission facilities that use frequencies greater than normal voice-grade, supported in local-area networks with RF modems and AC signaling. Also known as wideband. Employs multiplexing techniques that increase carrier frequency between terminals to provide:
 - Multiple (simultaneous) channels via FDM (Frequency Division Multiplexing)
 - Multiple (time-sequenced) channels via TDM (Time Division Multiplexing)
 - High-speed data transfer rate via parallel mode at rates of up to 96,000 baud (or higher, depending on media)

2. Transmission Facilities

Transmission facilities include wire, carrier, coaxial cable, microwave, optical fiber, satellites, cellular radio, and marine cable operating in one of two modes, depending on the vendor and the distribution of the network.

- *Mode* - may be either:
 - *Analog* - Transmission or signal with continuous-waveform representation, typified by AT&T's predominantly voice-grade DDD network and most telephone operating company distribution systems

- *Digital* - Transmission or signal using discontinuous, discrete quantities to represent data, which may be voice, data, record, video, or text, in binary form
- *Media* - May be any of the following:
 - *Wire* - Varies from earlier single-line teletype networks, to two-wire standard telephone (twisted pair), to four-wire, full-duplex balanced lines
 - *Carrier* - A wave, pulse train, or other signal suitable for modulation by an information-bearing signal to be transmitted over a communications system, used in multiplexing applications to increase network capacity
 - *Coaxial Cable* - A cable used in HF (high-frequency) and VHF (very high frequency), single-frequency, or carrier-based systems; requires frequent reamplification (repeaters) to carry the signal any distance
 - *Microwave* - UHF (ultra-high-frequency) multichannel, point-to-point, repeated radio transmission; also capable of wide frequency channels
 - *Optical Fiber* - Local signal distribution systems employed in limited areas, using light-transmitting glass fibers and TDM for multichannel applications
 - *Communications Satellites* - Synchronous earth-orbiting systems that provide point-to-point, two-way service over significant distances without intermediate amplification (repeaters), but requiring suitable groundstation facilities for up- and down-link operation
 - *Cellular Radio* - Network of fixed, low-powered two-way radios that are linked by a computer system to track mobile phone/data set units. Each radio serves a small area called a cell. The computer switches service connections to the mobile unit from cell to cell.

E

Definitions

- *Bill of Material (BOM)* - A listing of all subassemblies, parts, and materials that go into an assembled part (showing the quantities of each).
- *CAD/CAE* - The integrated applications of CAD and CAE.
- *Capacity Requirements Planning* - The translation of open shop orders and planned shop orders into hours of work by time period and work center.

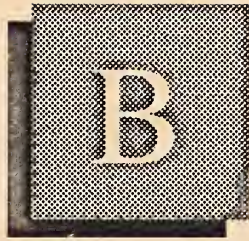
- *Computer-Aided Design (CAD)* - Applications of computer and graphic technology to engineering, design, and drafting.
- *Computer-Aided Engineering (CAE)* - The use of the full range of software and systems to model, simulate, and analyze a product before construction of production models.
- *Computer-Aided Maintenance Management (Camm)* - Systems for analyzing and scheduling maintenance in manufacturing plants. The predictive maintenance functions would be the next logical development.
- *Computer-Integrated Manufacturing (CIM)* - Integration of separately automated factory functions. These functions include MRPII, CAD/CAE, DSS, process control, ATE, and robotics. CIM is a philosophy of operations requiring management commitment.
- *Electronic Data/Document Interchange (EDI)* - The use of a communications network to transmit and receive electronic business transactions between multiple locations on an intra- or inter-company basis.
- *Finite Element Analysis* - As used in this report, includes all tasks involved in structural analysis using finite element methods—mesh generation, preprocessing, finite element analysis processing, and post-processing.
- *Group Technology* - The application of classification and coding technology to search a data base for information on similar parts and to apply this to CAD and CAM tasks.
- *Material Production Schedule* - An anticipated build schedule that drives the MRP systems.
- *Manufacturing Resource Planning (MRPII)* - An extension of MRP where MRP is integrated with financial planning, a simulation capability, and other functions on a closed-loop basis for the planning of all of the resources of a manufacturing company.
- *Nesting* - Software to automatically or interactively arrange patterns for parts within stock material boundaries.
- *Numerical Control (NC)* - Fixed sequence control of machine tool programs. (Also see DNC—Direct Numerical Control.)
- *Shipments* - The dollar equivalent of products shipped by a manufacturing establishment. Will usually be approximately equal to revenue.

- *Shop Floor Control* - Control of the progress of each customer order or stock order through the operations of its production cycle and the collection of data about actual completion status.
- *Value Added* - The portion of product shipment values originating in that industry; includes factors such as labor costs, depreciation, various business expenses, and energy costs. It is basically the difference between shipments and raw or input materials costs.

F

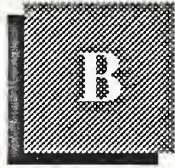
Other Definitions

- *Data Base Management System (DBMS)* - A software system that allows a user to structure a data base by defining the data, its organization, and the association between data elements. It also includes a data manipulation language (for accessing, sorting, merging, etc.) and controls for concurrent use (security, request, queuing, etc.). Functions as a common interface to multiple applications.
- *Distributed Data Base* - A data base that is physically located at multiple sites, with each site having a part of the total data base. The sites are usually linked to a central site and have access to each other.
- *Distributed Processing* - Multiple computers simultaneously processing elements of a CAD task.
- *Management Information System (MIS)* - A DP system specifically designed to provide business managers with company, financial, project, or program data.
- *Networking* - The interconnection and control of remotely located systems and devices over communications lines.



Appendix: Industry Sector Definitions





Appendix: Industry Sector Definitions

The standard industrial classification (SIC) codes are used to define the economic activity contained in generic sectors such as process manufacturing, insurance, or transportation.

The specific industries (and their SIC codes) included under these generic industry sectors are detailed in the exhibit.

EXHIBIT B-1

Industry Sector Definitions

Industry Sector	Industry SIC	Industry Name
Discrete Manufacturing	23	Apparel
	25	Furniture
	27	Printing
	31	Leather
	34	Metal
	35	Machinery
	36	Electronics
	37	Transportation
	38	Scientific and Control Instruments
	39	Miscellaneous
Process Manufacturing	10	Metal Mining
	11	Anthracite Mining
	12	Coal Mining
	13	Oil and Gas Extraction
	14	Mining/Quarrying of Non-Metallic Minerals, except Fuels
	20	Food Products
	21	Tobacco
	22	Textile Products
	24	Lumber and Wood Products
	26	Paper Products
	28	Chemicals
	29	Petroleum
	30	Rubber and Plastics
	32	Stone, Glass, Clay
	33	Primary Metals
Transportation	40	Railroads
	41	Local Transit
	42	Motor Freight
	43	U.S. Postal Service
	44	Water Transportation
	45	Air
	46	Pipelines
	47	Transportation Services

EXHIBIT B-1 (Cont.)

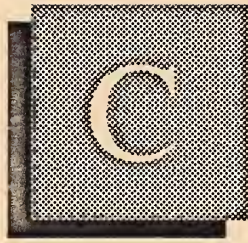
Industry Sector Definitions

Industry Sector	Industry SIC	Industry Name
Utilities	49	Electric, Gas, and Sanitary
Telecommunications	48	Communications
Wholesale Distribution	50	Durable Goods
	51	Nondurable Goods
Retail Distribution	52	Building Materials, Hardware
	53	General Merchandise
	54	Food
	55	Automotive and Gas Stations
	56	Apparel
	57	Furniture
	58	Eating and Drinking
	59	Miscellaneous Retail
Banking and Finance	60	Banks
	61	Credit Agencies
	62	Security and Commodity Brokers
	67	Holding and Investment Offices
Insurance	63	Insurance (Life, Health, Etc.)
	64	Insurance Agents
Medical	80	Health Services
Education	82	Educational Services

EXHIBIT B-1 (Cont.)

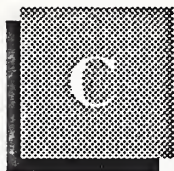
Industry Sector Definitions

Industry Sector	Industry SIC	Industry Name
Services	72	Personal Services
	73	Business Services (Excluding Information Services Companies Themselves)
	89	Miscellaneous Services
	66	Combinations of Real Estate, Insurance, Loans, Law Offices
	81	Legal Services
	76	Miscellaneous Repair
Federal Government	N/A	As Appropriate
State and Local Government	N/A	As Appropriate
Other Industries	01-09	Agriculture, Forestry, and Fishing
	15-17	Construction
	70	Hotels, Rooming Houses, Camps, and Other Lodging Places
	75	Automotive Repair, Services, and Garages
	78	Motion Pictures
	79	Amusement and Recreation Services, except Motion Pictures
	82	Educational Services
	83	Social Services
	84	Museums, Art Galleries, Botanical and Zoological Gardens
	86	Membership Organizations



Appendix: Systems Integration Forecast Data Base, 1989-1994





Appendix: Systems Integration Forecast Data Base, 1989-1994

EXHIBIT C-1

Systems Integration Forecast Data Base Banking/Finance

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	89	340	31
• Communications (Hardware)	28	152	40
• Applications Software Packages	11	78	48
• Systems Software Packages	8	44	41
• Consulting Services	21	66	26
• Project Management Fees	15	54	29
• Design/Integration	45	188	33
• Software Development	77	308	32
• Education/Training & Documentation	4	19	37
• Operation and Maintenance	4	19	37
• Other Expenditures	18	64	29
Total SI Expenditures (\$ Millions)	320	1,332	33

EXHIBIT C-2

Systems Integration Forecast Data Base Discrete Manufacturing

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	233	1,248	40
• Communications (Hardware)	43	240	41
• Applications Software Packages	31	196	45
• Systems Software Packages	17	107	44
• Consulting Services	36	125	28
• Project Management Fees	31	109	29
• Design/Integration	97	354	30
• Software Development	235	945	32
• Education/Training & Documentation	12	41	28
• Operation and Maintenance	11	38	28
• Other Expenditures	34	107	26
Total SI Expenditures (\$ Millions)	780	3,510	35

EXHIBIT C-3

Systems Integration Forecast Data Base Education

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	18	61	28
• Communications (Hardware)	5	13	21
• Applications Software Packages	2	9	35
• Systems Software Packages	2	8	32
• Consulting Services	4	6	8
• Project Management Fees	4	5	5
• Design/Integration	10	17	11
• Software Development	19	47	20
• Education/Training & Documentation	2	3	8
• Operation and Maintenance	1	1	0
• Other Expenditures	5	5	0
Total SI Expenditures (\$ Millions)	72	175	19

EXHIBIT C-4

Systems Integration Forecast Data Base Insurance

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	45	188	33
• Communications (Hardware)	9	62	47
• Applications Software Packages	5	37	49
• Systems Software Packages	5	15	25
• Consulting Services	16	45	23
• Project Management Fees	12	37	25
• Design/Integration	24	79	27
• Software Development	38	108	23
• Education/Training & Documentation	3	14	36
• Operation and Maintenance	1	11	62
• Other Expenditures	7	14	15
Total SI Expenditures (\$ Millions)	165	610	30

EXHIBIT C-5

Systems Integration Forecast Data Base Medical

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	76	185	19
• Communications (Hardware)	12	40	27
• Applications Software Packages	9	33	30
• Systems Software Packages	8	24	25
• Consulting Services	8	22	22
• Project Management Fees	8	22	22
• Design/Integration	18	59	27
• Software Development	56	167	24
• Education/Training & Documentation	1	9	55
• Operation and Maintenance	1	9	55
• Other Expenditures	13	40	25
Total SI Expenditures (\$ Millions)	210	610	24

EXHIBIT C-6

Systems Integration Forecast Data Base Process Manufacturing

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	48	112	18
• Communications (Hardware)	13	35	22
• Applications Software Packages	4	10	20
• Systems Software Packages	5	12	19
• Consulting Services	3	8	22
• Project Management Fees	5	14	22
• Design/Integration	11	26	19
• Software Development	33	83	20
• Education/Training & Documentation	1	4	32
• Operation and Maintenance	1	4	32
• Other Expenditures	9	22	20
Total SI Expenditures (\$ Millions)	133	330	20

EXHIBIT C-7

Systems Integration Forecast Data Base Retail Distribution

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	52	254	37
• Communications (Hardware)	15	83	41
• Applications Software Packages	4	21	39
• Systems Software Packages	8	45	41
• Consulting Services	10	45	35
• Project Management Fees	8	38	37
• Design/Integration	26	124	37
• Software Development	51	278	40
• Education/Training & Documentation	3	11	30
• Operation and Maintenance	1	11	62
• Other Expenditures	8	30	30
Total SI Expenditures (\$ Millions)	186	940	38

EXHIBIT C-8

Systems Integration Forecast Data Base
Services

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	11	36	27
• Communications (Hardware)	4	15	30
• Applications Software Packages	1	4	32
• Systems Software Packages	1	3	25
• Consulting Services	1	4	32
• Project Management Fees	1	4	32
• Design/Integration	5	16	26
• Software Development	11	39	29
• Education/Training & Documentation	1	3	25
• Operation and Maintenance	*	2	32
• Other Expenditures	3	8	22
Total SI Expenditures (\$ Millions)	39	134	28

* Less than \$1 million

EXHIBIT C-9

Systems Integration Forecast Data Base State and Local Government

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	138	417	25
• Communications (Hardware)	39	137	29
• Applications Software Packages	21	74	29
• Systems Software Packages	11	39	29
• Consulting Services	22	70	26
• Project Management Fees	21	58	23
• Design/Integration	40	148	30
• Software Development	127	340	22
• Education/Training & Documentation	7	19	22
• Operation and Maintenance	7	16	18
• Other Expenditures	32	54	11
Total SI Expenditures (\$ Millions)	465	1,372	24

EXHIBIT C-10

Systems Integration Forecast Data Base Telecommunications

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	34	100	24
• Communications (Hardware)	10	24	19
• Applications Software Packages	5	13	21
• Systems Software Packages	2	5	20
• Consulting Services	6	14	18
• Project Management Fees	11	22	15
• Design/Integration	19	39	15
• Software Development	55	141	21
• Education/Training & Documentation	2	6	25
• Operation and Maintenance	1	4	32
• Other Expenditures	5	17	28
Total SI Expenditures (\$ Millions)	150	385	21

EXHIBIT C-11

Systems Integration Forecast Data Base Transportation

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	34	84	20
• Communications (Hardware)	16	49	25
• Applications Software Packages	4	9	18
• Systems Software Packages	1	5	38
• Consulting Services	10	15	8
• Project Management Fees	6	10	11
• Design/Integration	16	26	10
• Software Development	38	91	19
• Education/Training & Documentation	2	5	20
• Operation and Maintenance	1	3	25
• Other Expenditures	5	13	21
Total SI Expenditures (\$ Millions)	133	310	18

EXHIBIT C-12

Systems Integration Forecast Data Base Utilities

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	79	325	33
• Communications (Hardware)	10	46	36
• Applications Software Packages	4	20	38
• Systems Software Packages	3	10	27
• Consulting Services	12	25	16
• Project Management Fees	9	22	20
• Design/Integration	18	53	24
• Software Development	72	236	27
• Education/Training & Documentation	3	8	22
• Operation and Maintenance	1	5	38
• Other Expenditures	9	35	31
Total SI Expenditures (\$ Millions)	220	785	29

EXHIBIT C-13

Systems Integration Forecast Data Base Wholesale Distribution

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	40	82	15
• Communications (Hardware)	10	24	19
• Applications Software Packages	2	5	20
• Systems Software Packages	5	10	15
• Consulting Services	7	15	16
• Project Management Fees	6	13	17
• Design/Integration	18	39	17
• Software Development	36	90	20
• Education/Training & Documentation	1	4	32
• Operation and Maintenance	1	4	32
• Other Expenditures	6	14	18
Total SI Expenditures (\$ Millions)	132	300	18

EXHIBIT C-14

Systems Integration Forecast Data Base Other Industries

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	20	87	34
• Communications (Hardware)	5	18	29
• Applications Software Packages	2	13	45
• Systems Software Packages	2	11	41
• Consulting Services	5	9	12
• Project Management Fees	5	7	7
• Design/Integration	16	25	9
• Software Development	20	67	27
• Education/Training & Documentation	2	4	15
• Operation and Maintenance	1	2	15
• Other Expenditures	4	7	12
Total SI Expenditures (\$ Millions)	82	250	25

EXHIBIT C-15

Systems Integration Forecast Data Base Total All Commercial Industries

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	917	3,519	31
• Communications (Hardware)	219	938	34
• Applications Software Packages	105	522	38
• Systems Software Packages	78	338	34
• Consulting Services	162	472	24
• Project Management Fees	141	412	24
• Design/Integration	363	1,193	27
• Software Development	868	2,940	28
• Education/Training & Documentation	44	150	28
• Operation and Maintenance	32	129	32
• Other Expenditures	158	430	22
Total SI Expenditures (\$ Millions)	3,087	11,043	29

EXHIBIT C-16

Systems Integration Forecast Data Base Federal Government

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	1,005	2,089	16
• Communications (Hardware)	90	150	11
• Applications Software Packages	42	110	21
• Systems Software Packages	94	247	21
• Consulting Services	99	240	19
• Project Management Fees	82	211	21
• Design/Integration	300	783	21
• Software Development	828	1,794	17
• Education/Training & Documentation	21	51	19
• Operation and Maintenance	35	95	22
• Other Expenditures	93	250	22
Total SI Expenditures (\$ Millions)	2,689	6,020	17

EXHIBIT C-17

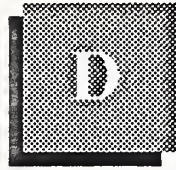
Systems Integration Forecast Data Base Total All Industries

SI Component Expenditures (\$ Millions)	Market Size 1989	Market Size 1994	CAGR 1989- 1994 (Percent)
• Information Systems (Hardware)	1,922	5,608	24
• Communications (Hardware)	309	1,088	29
• Applications Software Packages	147	632	34
• Systems Software Packages	172	585	28
• Consulting Services	261	712	22
• Project Management Fees	223	623	23
• Design/Integration	663	1,976	24
• Software Development	1,696	4,734	23
• Education/Training & Documentation	65	201	25
• Operation and Maintenance	67	224	27
• Other Expenditures	251	680	22
Total SI Expenditures (\$ Millions)	5,776	17,063	24



Appendix: Forecast Data Base Reconciliation, 1988-1989





Appendix: Forecast Data Base Reconciliation, 1988-1989

The systems integration markets, both commercial and federal, saw a variety of forces affect the rates of growth since the 1988 INPUT forecast. This appendix compares the forecasts for the fifteen vertical markets for two specific years—1989 and 1993—made in 1988 and 1989. The comparison appears in Exhibit D-1 at the end of the text. The following discusses the changes in the marketplace that INPUT believes will modify market performance.

In the forecasts for 1989, nine vertical industries changed 3% or less from the 1988 forecast. In 1993, most of these industries will vary from the 1988 view by much more than 3% for factors that will be common to most of the market. The most frequently mentioned changes are slower growth of the economy, governmental fiscal restraint, ripple effects of the expected reduction in defense outlays, increased competition from Europe and the Pacific Rim, and narrowing margins in most commercial sectors.

The medical industry demonstrates a 4% improvement in the 1989 forecast, a result of strong gains in pharmaceuticals and medical supplies. Its growth was moderated by losses experienced by health providers with rising labor costs and insurance payment restraints. In 1993, the variance shifts downward slightly, in response to the lower profits expected by economists.

Other industries saw some adverse conditions in late 1988 and 1989 that resulted in 9% lower expenditures than predicted in 1988 for new systems. Agriculture saw losses caused by droughts and increasing imports. Commercial fishing had some improvements, but hotels have overbuilt and competing fast food chains reduced prices to nearly the break-even point. Food exports are expected to increase with new opportunities in Russia and China, and the lowered value dollar is expected to boost recreation and hotel incomes toward the mid-1990s. The result should be an increase in 1993 that is 3% better than predicted in 1988.

After a marked increase between 1987 and 1988, the federal government is slowing down in the 1990s. The major impact will be felt by defense in lower outlays for embedded systems for weapons and platforms (aircraft, tanks, ships). Lessened organizational demand will delay the planned acquisition of replacement systems. Government agencies are also spending less on hardware than foreseen. This change comes from downsizing of applications from mainframes to minicomputers, and a substantial shift from minicomputers to the more powerful, fast and flexible PCs and workstations. In 1989, the reduction is 8% less than predicted in 1988. The reduction will increase to 11% by 1993, as the emphasis continues to shift to civil agencies.

The banking and financial sector continues to decline in growth potential since the high expectancies of 1986 and 1987. In 1989, the level of annual spending declined by 6% from the 1988 forecast. The lower CAGR forecasted in 1989 will lead to a 34% variance in 1993—a very severe decline, in INPUT's experience.

Losses in the savings and loans, sharp declines in real estate investments, and low profits in money center banks overpower the gains of the credit unions and financial services. Acquisitions of smaller and weaker financial institutions have substantially reduced the demand for new systems.

INPUT indicated in last year's evaluation of vertical markets that the transportation industry is facing a number of crises, including rising fuel costs, competition in maritime shipping from several countries in South America and the Pacific Rim, and mounting losses in rail operations. The reduction of spending in the SI market in 1989 is only 1%, but increases to 19% by 1993, making it the second largest decline in INPUT's view of prospects. The next greatest decrease in opportunities is apparent in wholesale distribution, where the 6% negative variance in 1989 becomes 16% by 1993. This past year saw a 29% decline of revenues in auto parts, metals, and auto sales that will not be recovered by gains in other areas.

Utilities have been unable to overcome the effects of rising fuel costs and the expense of replacing partially built nuclear power plants with fossil fuel facilities, or to convince public utility commissions that rate increases are justified. The expenditures for better electric grid control systems are delayed, and some are converting their billing systems to systems operations by vendors like EDS. This action effectively reduces the SI market seen in 1988 by 4% in 1989, and the gap falls to 12% in 1993—below that predicted only a year ago.

The services industry improved during the past year by 2%, helped by real estate services, public relations and rising legal actions. The long-

term effect of mergers and acquisitions by the larger firms will lead to more use of information service firms and less acquisition of integrated systems. The result will be a decline in 1993 of 13% from earlier opportunity prospects. The smaller organizations will increase the use of turnkey systems and high-powered PCs, rather than invest in larger systems.

Retail distribution was down slightly in 1989, reflecting increasing consumer resistance in these uncertain economic conditions. Further, some of the largest chains have gone through expensive buyouts and acquisitions, and now face heavy debts. Purchase of improved systems is now expected to slow down further, reaching 11% less in 1993 than predicted in 1988.

Though process manufacturing maintained spending in 1989 at the level predicted earlier, some retrenching is expected in the next five years. Financial problems include environmental cleanup costs, rising labor and raw material costs, and lower-than-anticipated growth in forest products, paper, and chemicals. For these reasons, it now appears quite likely that the 1993 outlays will be 11% lower than predicted a year ago.

Many discrete manufacturing firms saw improved revenues in 1989, but they have not yet begun to prepare for the competition of Europe 1992. Improved margins allowed the industry to increase SI expenditures by 2% this year. Worldwide demand for heavy equipment and a strong cosmetics market are drivers that will push the industry into a 13% increase in SI expenditures over the 1988 forecast by 1993, making it the fastest growing commercial market.

EXHIBIT D-1

Systems Integration Market Forecast Data Base Reconciliation by Industry Sector

Industry Sector	1989 Market Year of Forecast			1993 Market Year of Forecast		
	1988	1989	Var (%)	1988	1989	Var (%)
Banking/Finance	339	320	-6	1,485	985	-34
Discrete Manufacturing	757	780	2	2,310	2,600	13
Education	70	72	3	140	150	7
Insurance	160	165	2	450	475	6
Medical	210	210	4	500	490	-2
Process Manufacturing	133	133	0	310	275	-11
Retail Distribution	190	186	-2	750	667	-11
Services	40	39	2	130	100	-13
State and Local Government	470	465	-1	1,060	1,103	4
Telecommunication	150	150	0	300	325	8
Transportation	135	133	-1	335	270	-19
Utilities	230	220	-4	690	610	-12
Wholesale Distribution	140	132	-6	310	260	-16
Other Industries	90	82	-9	195	200	3
Commercial Subtotal	3,114	3,087	-1	8,965	8,510	-5
Federal Government	2,910	2,689	-8	5,760	5,145	-11
Total SI Market	6,024	5,776	-4	14,725	13,655	-7

